U.S. Department of Energy
Office of River Protection
P.O. Box 450
Richland, Washington 99352

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SEP 0 6 2002

02-EMD-154

Mr. Jerry Leitch, Chief
Radiation and Indoor Air Section
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, Washington 98101

Mr. A.W. Conklin, Head
Air Emissions and Defense
Waste Section
State of Washington
Department of Health
P.O. Box 47827
Olympia, Washington 98504

Addressees:

APPROVAL OF UPDATED RADIOACTIVE AIR EMISSIONS NOTICE OF CONSTRUCTION (NOC) FOR 244-CR FACILITY INTERIM STABILIZATION ACTIVITIES, REVISION 1

In accordance with Washington Administrative Code (WAC) 246-247-060, a revised modification to the "Radioactive Air Emissions Notice of Construction (NOC) 244-CR Facility Interim Stabilization Activities," is being submitted for approval per your letter, AIR-00-206, dated February 15, 2000, and Mr. John Martell's e-mail, dated July 24, 2002. The revised modification incorporates the State of Washington Department of Health (WDOH) comments and corrects calculation errors found during review. For your convenience a redlined copy of the modified NOC is enclosed. Significant changes have been highlighted.

The revised NOC is enclosed for WDOH and the U.S. Environmental Protection Agency review and formal approval. The NOC is being submitted in accordance with the WAC 246-247, "Radiation Protection of Air Emissions," and Title 40 Code of Federal Regulations, Part 61, "National Emission Standards for Hazardous Air Pollutants."

If you have any questions, please contact Dennis W. Bowser, of my staff, (509) 373-2566.

Sincerely,

James E. Rasmussen, Director
Environmental Management Division

EMD:DWB

Enclosure

cc w/encls:
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J. J. Martell, WDOH Kennewick Office (4 copies)
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R. Lee, YN
Administrative Record

Enclosure
02-EMD-154

Revised Radioactive Air Emissions Notice of Construction 244-CR Facility Interim Stabilization Activities

CONTENTS

TABLES

ATTACHMENTS

TERMS

ALARA	as low as reasonably achievable
ALARACT	as low as reasonably achievable control technology
AMCA	Air movement and control association
ANSI	American National Standards Institute
ASME	American Society Mechanical Engineers
CFR	Code of Federal Register
DCRT	double-contained receiver tank
FFCA	Federal Facility Compliance Agreement
HEPA	high-efficiency particulate air
MCC	motor control center
MEI	maximally exposed individual
MPR	maximum public receptor
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOC	notice of construction
PTRAEU	Portable/Temporary Radioactive Air Emission Unit
RCT	Radiation Control Technician
SEPA	State Environmental Policy Act of 1971
TEDE	total effective dose equivalent
TWRS	tank waste remediation system
WAC	Washington Administrative Code
WDOH	Washington State Department of Health

METRIC CONVERSION CHART

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.0393	inches
inches	2.54	centimeters	centimeters	0.393	inches
feet	0.3048	meters	meters	3.2808	feet
yards	0.914	meters	meters	1.09	yards
miles	1.609	kilometers	kilometers	0.62	miles
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.092	square meters	square meters	10.7639	square feet
square yards	0.836	square meters	square meters	1.20	square yards
square miles	2.59	square kilometers	square kilometers	0.39	square miles
acres	0.404	hectares	hectares	2.471	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	grams	0.0352	ounces
pounds	0.453	kilograms	kilograms	2.2046	pounds
short ton	0.907	metric ton	metric ton	1.10	short ton
Volume			**Volume**		
fluid ounces	29.57	milliliters	milliliters	0.03	fluid ounces
quarts	0.95	liters	liters	1.057	quarts
gallons	3.79	liters	liters	0.26	gallons
cubic feet	0.03	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.76456	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.948	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds per square inch	6.895	kilopascals	kilopascals	1.4504×10^{-1}	pounds per square inch

Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Second Ed., 1990, Professional Publications, Inc., Belmont, California.

NOTICE OF CONSTRUCTION FOR ISOLATION AND INTERIM STABILIZATION OF THE TANK FARM 244-CR VAULT

The following description and any attachments and references are provided to the Washington State Department of Health (WDOH), Division of Radiation Protection, Air Emissions & Defense Waste Section as a notice of construction (NOC) in accordance with Washington Administrative Code (WAC) 246-247, Radiation Protection – Air Emissions. WAC 246-247-060, "Applications, registration, and licensing", states "This section describes the information requirements for approval to construct, modify, and operate an emission unit. Any NOC requires the submittal of information listed in Appendix A." Appendix A (WAC 246-247-110) lists the requirements that must be addressed.

The total effective dose equivalent (TEDE) to the maximally exposed individual (MEI) for each activity covered by this NOC is: 8.34 E-05 mrem/year for hand digging, 8.34 E-02 mrem/year for operation of the guzzler, 8.57E-04 mrem/year for sampling activities, 8.57E-04 mrem/year for facility equipment activities: installation/disconnection/repair of new and existing tank/vault equipment, 2.11 E-03 mrem/year for modifications/maintenance to pits, pipes, risers, 2. 11E-03 mrem/year for decontamination activities, 2.11 E-03 mrem/year for removal and disposition of excess equipment, 2.13 E-07 mrem/year for pit cover removal activities, and 5.31E+01 mrem/year for tank pumping equipment during operation of the exhauster, and 5.10E+00 mrem/year for installation/operation of the passive breather filter assembly.

1.0 LOCATION

Pit Designation:	200 Area:	Geographic Coordinates:	
		North Latitude	West Longitude
244-CR Vault	East	46° 33' 24"	119° 31' 11"

2.0 RESPONSIBLE MANAGER

Mr. R. J. Schepens, Manager
U.S. Department of Energy,
Office of River Protection
P.O. Box 450
Richland, Washington 99352
(509) 376-6677

3.0 PROPOSED ACTIONS

The proposed action is to remove the 244-CR Vault from service and interim-stabilize the facility. This will consist of transferring tank waste out of the facility; decontamination; isolation of the facility; and intrusion prevention. These activities may be performed at the 244-CR Vault facility, ER-153 and/or 244-A Lift Station. These activities include (an * notes an action with a potential to emit):

Work Area Preparation

- Miscellaneous work including equipment delivery, movement, set up and maintenance in the general work area around the 244-CR Vault facility and used to support activities described in this NOC, that will not increase emissions above those described in Section 13 of this NOC

- Construction and take down of open top containment tents (bullpens) over the facility vault area
- Installation of Portable/Temporary Radioactive Air Emission Unit(s) (PTRAEUs)
- Installation of portable 1,000 cubic feet per minute (cfm) exhauster
- Removal and/or installation of vault foam covering
- Application of fixative at pit interior
- Temporary power installation

Facility/Interim Stabilization Work

- Operation of PTRAEU for bullpen ventilation*
- Removal and/or installation of pit covers*
- Inspection of pits, vaults, and tanks
- Removal and disposition of excess equipment and waste in pits, risers, and tanks*
- Decontamination activities*
- Measurement of liquid level and sludge levels in tanks and sumps
- Sampling activities in pits, vaults, and tanks including chemical addition and/or waste sampling to determine Double Shell Tank waste acceptance*
- Facility equipment activities: installation, disconnection, repair, replacement, and/or leak testing, of new and existing facility equipment (valves, jumpers, pumps, leak detectors, or other instrumentation/equipment)*
- Modifications, maintenance, and/or isolation and sealing of existing risers, pits, vaults and incoming and/or outgoing piping (drain and transfer lines) from 244-CR Vault or connected facility*
- Excavation*
- Installation of permanent power to 244-CR vault facility
- Installation/Operation of Passive Breather Filter Assembly*

Waste transfer and support activities

- Operation of 1,000 cfm portable exhauster at 244-CR Vault*
- New waste transfer system, waste staging/consolidation*

4.0 STATE ENVIRONMENTAL POLICY ACT

The proposed action is categorically exempt from the requirements of State Environmental Policy Act of 1971 (SEPA) under WAC 197-11-845.

5.0 CHEMICAL AND PHYSICAL PROCESSES

Chemical and physical processes involved are those activities listed in Section 3.0. This section provides a brief description of the emission unit and a description of each activity listed in Section 3.0. Wherever possible, approved ALARACTs will be used. For activities which can not be performed in accordance with an ALARACT, alternate controls will be listed. Those controls are discussed in Section 6. 244-CR vault is excluded from coverage under ALARACTS 6 Tank Farm ALARACT Demonstration for Pit Access, and ALARACT 14 Tank Farm ALARACT Demonstration for Pit Work.

5.1 Facility Description

The 244-CR Vault (Attachment 1) is a two-level, multi-cell structure constructed below grade of reinforced concrete. The lower cell contains one carbon steel and three stainless steel process tanks, each equipped with a concrete sump. The CR-003 tank contains an existing transfer pump and agitator and is used as a double-contained receiver tank (DCRT). The upper cell contains piping and equipment. A DCRT is a type of waste transfer tank, which together with its related equipment, constitutes a short-term storage area for liquid waste and has a pump pit for waste transfer operations. This vault provides short-term storage for waste pumped from the 241-C Tank Farm in the 200 East Area and/or waste pumped from other CR Vault tanks. Waste transfer lines are connected inside the pit by installing a jumper between connecting nozzles. The vault structure is covered by concrete cover blocks and steel plates that are removed to allow access to the piping and equipment cells. A foam (or partial foam) covering is over the concrete cover blocks and steel plates.

The 244-CR Vault's ventilation system has been operating in a passive mode approximately 1 year as a result of exhaust equipment failure. The 244-CR Vault's exhaust system (stack 296-C-05) is one of the systems to be updated under the Federal Facility Compliance Agreement (FFCA) dated February 7, 1994. The purpose is to bring the emission unit into compliance with National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations, 40 CFR Part 61, Subpart H. A Notice of Construction for this upgrade (Project W-420, Stack Monitoring System Upgrades for 296-A-25, 296-B-28, 296-C-5, 296-P-16, 296-S-22, and 296-T-18) has been submitted and approved covering the planned upgrade. In accordance with the FFCA, the 244-CR Vault's exhaust system is to be brought into compliance with NESHAP regulations by December 31, 2005 or shutdown. In lieu of completing this upgrade, the 244-CR Vault will be removed from service and interim stabilized.

During planned CR-Vault Interim Stabilization waste transfer activities, the facility will be actively ventilated by temporary exhaust systems. The first system consists of PTRAEU(s) to ventilate open top containment tents (known as bullpens) to prevent potential airborne contamination during pit activities described in Sections 5.2.1 and 5.2.2. A second portable exhauster will be equipped with compliant monitoring (see Table 18-2) and sampling equipment and used during waste transfer and support activities which may include activities described in Sections 5.2.2 and 5.2.3. All 244-CR interim stabilization activities emissions will be controlled as stated in Section 6.0, Proposed Controls.

5.2 Process Description

A planning process precedes all work. For complex work activities, an enhanced work planning process is used that expands the normal planning process to ensure increased field involvement and more

detailed review, including lessons learned. This ensures work activities are evaluated for special controls considering the degree of contamination in the pits cells and tanks, the type of work to be performed, previous experience and the potential for process upsets that could contribute to an environmental release or personnel injury. Potential emissions have been calculated for those activities (noted by a *) identified as possible emission sources. As the PTRAEU and portable exhauster are operated in support of the activities for which potential emissions have been calculated, emissions specific to the exhausters have not been calculated.

5.2.1 Work Area Preparation

Miscellaneous activities that will not increase emissions above those described in Section 13 of this NOC.

Miscellaneous activities including equipment delivery, movement, set up and maintenance needed to support the work preparation, facility work, waste transfer and interim stabilization of 244-CR vault.

Construction and take down open top contaminant tents over the facility vault area

Open top containment tents (bullpens) will be constructed over the facility pit area to prevent potential airborne contamination from the effected work area to the environment. Two bullpens will be erected around two instrumentation pits at the 244-CR Vault. Upon completion of the first pit's work, the bullpens will be relocated to the other two pits and their work will be completed.

Installation of Portable/Temporary Radioactive Air Emission Unit(s) (PTRAEUs)

A Portable/Temporary Radioactive Air Emission Unit (2,000 cfm) or units (1,000 cfm each) will be installed to ventilate the bullpens during activities that require work in the pits, cells and tank vault area prior to performing waste transfer activities. One thousand cfm PTRAEUs, if used, will be directly connected to individual bullpens, while a 2,000 PTRAEU if used, will be connected to two bullpens. Movement and installation of the PTRAEU may be performed to facilitate ventilation for the four vaults of the 244-CR facility. The PTRAEU will operate intermittently (during work activities) and will be operated in accordance with the latest WDOH approval, AIR 99-1102, for the Portable/Temporary Radioactive Air Emission Unit (PTRAEU) NOC (DOE/RL-96-75).

Installation of portable 1,000 cfm exhauster

A portable 1,000 cfm exhauster will be installed to ventilate the 244-CR facility vaults and tanks during waste transfer activities. A drawing of a typical portable exhauster is presented in Attachment 2. This exhauster will operate intermittently to support waste transfer and support activities and will monitor air emissions. The exhauster will be piped into the existing 244-CR facility ventilation system upstream of the existing (non-operating) exhauster, 296-C-05 and HEPA filters. The existing 244-CR facility exhaust system will be isolated and not used. Tie in of the 1,000 cfm exhauster to the existing exhaust system will be in accordance with ALARACT 16, Tank Farm ALARACT Demonstration for Work on Potentially Contaminated Ventilation System Components. After the waste transfer is completed, the exhauster will be removed.

Removal and/or installation of vault foam covering

A foam covering has been placed over the 244-CR Vault area to prevent intrusion of precipitation and snowmelt. In order to gain access to the pit cover (metal) plates or concrete cover blocks, sections of the

foam will be removed, packaged, transported and disposed of. ALARACT 4, Tank Farm ALARACT Demonstration For Packaging and Transportation of Waste will be used to properly disposition the removed foamed covering. Radiation control technicians (RCT) will monitor the affected work area while the foam covering is being removed. The foam covering will be replaced after work is complete, as part of intrusion prevention measures completed by the project following waste transfer activities.

Application of fixative at pit interior

A fixative may be applied either with the pit covers on or off. The fixatives can be applied to pit surfaces through a port in the pit cover using a 'whirly' or by fogging. A hand held sprayer is used to apply fixatives to local areas within the pit when the pit cover is off.

Temporary power installation

Temporary power installation will be limited to meet the needs to support the work described in this NOC. Temporary installations may be removed when no longer needed.

5.2.2 Facility/Interim Stabilization Work

Operation of PTRAEU for bullpen ventilation*

Ventilation of the bullpens during pre waste transfer tank activities and prior to the installation of the 1,000 cfm portable exhauster will be accomplished with the use of PTRAEU(s). The PTRAEU(s) will be operated in accordance with the latest WDOH approval, AIR 99-1102, for the Portable/Temporary Radioactive Air Emission Unit (PTRAEU) NOC (DOE/RL-96-75). Operation of the PTRAEU is considered an emissions control (no estimated emissions calculated).

Removal and/or installation of pit covers*

Concrete cover key blocks are removed first, and only blocks necessary to perform intended work are removed. Consideration is given to sliding blocks to minimize the number of blocks to be removed. As discussed in the following, pit covers are decontaminated and/or covered with fixative before removal. Pit Covers are raised a minimum distance to safely allow a radiation protection technician to perform a dose rate and contamination survey. Pit covers are wrapped in plastic and set down in a specially prepared lay-down area. On completion of activities, the plastic wrap is removed from the pit covers and the pit covers are re-installed in their original position and orientation. Post-job surveys are performed.

Potential emissions calculation presented in Attachment 8.

Inspection of pits, vaults, and tanks

Inspections, such as visual, video, or nondestructive inspections, could be performed with pit covers in place (for pit with access ports) or removed. The pit cover design, historical inspection information, and ALARA information will be used to determine whether the inspection will be performed manually (with pit cover removed) or remotely with a camera and the pit covers in place.

Removal and disposition of excess equipment and waste in pits, risers, and tanks*

Various items, including but not limited to excess equipment and debris currently located in the 244-CR vault pits, and in-tank equipment will be removed to accommodate new waste transfer equipment and piping. Excess equipment will be replaced with replacement in kind equipment, as necessary.

To facilitate the removal and disposition of these items, size reduction and decontamination activities may be utilized. Size reduction activities may include cutting up unusable equipment (usually jumpers/blanks) remotely, using hydraulic shears or low revolutions per minute portable band saws. All size reduction activities will be performed in accordance with ALARACT Demonstration 15, TWRS ALARACT Demonstration for Size Reduction of Waste Equipment for Disposal.

Disposition of excess equipment and waste will be performed in accordance with ALARACT Demonstration 4, TWRS ALARACT Demonstration for packaging and transportation of waste.

Potential emissions calculation used to best represent these activities is the same as decontamination activity calculations presented in Attachment 9.

Decontamination activities*

Removable contamination in the accessible portions of the pit is reduced to less than 100,000 disintegrations per minute/100 square centimeters beta/gamma and 2,000 disintegrations per minute/100 square centimeters alpha by washing, or an approved fixative is applied to pit surfaces. Initial washing with a low pressure (125 pounds per square inch gauge), or high pressure (3,000 pounds per square inch gauge) 'whirly' is accomplished through a port in the pit cover blocks. Additional decontamination activities (with the cover block off) include the use of chemicals, peel and strip paints, water, or manual scrub brushes.

After a section of equipment has been washed it is pulled into plastic sleeving and sealed by horse tailing and taping.

Potential emissions calculation presented in Attachment 9.

Measurement of Liquid level and sludge levels in tanks and sumps

Liquid and sludge levels may be determined using zip cords or other appropriate means that will not disturb the waste more than zip cords.

Sampling activities in pits, vaults, and tanks including chemical addition and/or waste sampling to determine Double Shell Tank waste acceptance*

Sampling activities will be performed in the tank and sump area of 244-CR vault by way of risers in the riser pit in accordance with ALARACT 7, "Tank Farm ALARACT Demonstration For Tank Waste Grab Sampling." Radiological controls for riser preparation/opening listed in ALARACT 1, "Tank Farm ALARACT Demonstration for Riser Preparation/opening," will be followed.

The waste transfer processes will transfer waste from tanks CR-011, CR-001, CR-002 and CR-003 and sumps within 244-CR vault facility to a staging tank within the 244-CR facility. The transfer system to consolidate the waste from individual tanks consists of above ground piping of a hose in hose with leak detection at each tank's pit being utilized to support the transfer line. Mixing and dilution of the waste may take place at the receiving tank or within the transfer lines directly. The transfer system may include equipment pump skids and will include appropriate connections to the transfer lines to accommodate chemical and water addition to the 244-CR facility tanks and mixing prior to transfer to the designated Double Shell Tank (DST).

Potential emissions calculation used to best represent these activities is the same as pipe cutting activity calculations presented in Attachment 10.

Facility Equipment Activities: installation, disconnection, repair, replacement, and/or leak testing, of new and existing facility equipment (valves, jumpers, pumps, leak detectors, or other instrumentation/equipment)*

Before entry into a pit, an evaluation is made by engineering and/or operations personnel to determine the transfer routing configuration after pit work is complete. On removal of cover blocks, a visual inspection of pit contents is made to verify present configuration.

Tools such as impact wrenches, T-bars, and pike poles are used to repair or replace pit equipment. All equipment coming out of the pit is wrapped in plastic or otherwise contained or decontaminated for reuse or disposal. Removable contamination on the outer-most container will not exceed 1,000 disintegrations per minute/100 square centimeters beta/gamma and 20 disintegrations per minute/100 square centimeters alpha before removal from the bullpen. Disposition of non reusable equipment waste will be performed in accordance with ALARACT Demonstration 4, TWRS ALARACT Demonstration for packaging and transportation of waste.

Jumper work could be preceded by flushing the appropriate transfer lines with water. Jumper work is accomplished remotely, using a crane to maneuver heavy equipment and parts. Installation, disconnection, and/or changing jumpers/blanks are accomplished by slowly loosening the jumper/blank at the connector head. The required jumper/blank is positioned and tightened to the new connector heads. If the process line or equipment being worked on is connected physically to other unnecessary transfer lines, or if the line is to be left unused, a cap, blank, or equivalent is installed on all open nozzles not connected to jumpers.

Leak testing of newly installed jumpers/blanks normally is performed with pressurized water before initiating waste transfers. Occasionally, a jumper leak test is performed during the initial stages of the transfer. In either case, cover blocks are in place before leak testing is performed.

Cutting up unusable pit equipment (usually jumpers/blanks) is accomplished remotely using hydraulic shears or low revolutions per minute portable band saws. Cutting activities will be performed in the bullpen or in glovebags. The goal will be to maintain a contamination level equal to or less than 1,000 dpm/100 cm^2 beta gamma and 20 dpm/100 cm^2 alpha, during cutting activities, but may not always be attainable. RCT coverage will be provided. Should contamination levels exceed 1,000-dpm/100 cm^2 additional sleeving, or use of a glove bag may be used and/or decontamination activities performed to lower the levels in accordance with ALARA. Welding (if required) will commence once removable contamination levels in the cut and weld area are reduced to ALARA. Size reduction (cutting) activities will be performed in accordance with ALARACT Demonstration 15, *TWRS ALARACT Demonstration for Size Reduction of Waste Equipment for Disposal.*
To ensure that water intrusions or potential residual waste in piping are eliminated from the facility, existing piping and transfer lines to and from the 244-CR Vault facility will be blanked, grouted, or sealed. The isolation includes activities such as installing plugs, caps, blind flanges, or grouting. Isolations may occur at the 244-CR riser pit area or at the other end of the pipe in a diversion or valve box, at the ER153 or the 244A Lift Station.

Potential emissions calculation used to best represent these activities is the same as pipe cutting calculations presented in Attachment 10.

Modifications, maintenance, and/or isolation and sealing of existing in route pits, vaults and piping (drain and transfer lines) to support and/or installation of new transfer lines*

Modifications to existing in-route pits, vaults and piping may be required to establish the waste transfer route or to ensure the integrity of the system prior to waste transfer. These modifications may include but are not limited to, removal of existing parts and replacement with like parts, installation of new jumpers, or blanking off of equipment. When possible existing blanks will be utilized. Pipe cutting will be minimized in compliance with ALARA. If it is determined that the installation of a new above ground transfer line would be the best engineering method to establish a waste transfer route, a temporary transfer route may be established following existing design and installation procedures. This temporary route will be either above ground or in a shallow trench. If a trench is required excavation will be performed as described under that activity in this NOC.

Maintenance activities to establish or maintain flow include but are not limited to cleaning drains, unplugging transfer lines, and flushing of lines and equipment utilizing the best available technology.

These operations can be performed with cover blocks on or off, depending on the design of cover blocks and the special circumstances surrounding the operations to be performed. Pit drains are checked using water from a tanker truck or another source. Water at a flow rate of approximately 20 gallons per minute is added to a pit drain line and subsequently monitored to verify the pit drains are free of restrictions. At times it might be necessary to pump the DCRT that receives the water after the water passes through the pit drain if the volume of test water approaches the capacity of the DCRT.

Either flushing with water and/or using a retrieval tool to remove debris from the drain are used to clear plugged drains. Water supply valves are opened slowly to minimize splashing. Pressures above 50 pounds per square inch gauge require approval from the engineering organization. When possible, cover blocks remain in place and work is accomplished through a penetration in the cover block.

The waste transfer operations involve the pumping of liquid waste that contains dissolved solids. These solids can precipitate out of solution anywhere in the transfer path and cause blockage. If blockage is detected in the system, flushing the lines with hot water is necessary. The hot water is introduced to the system to be flushed through a pressure manifold by piping connected directly to a jumper or nozzle. These operations may be performed with the pit covers on or off.

To ensure that water intrusions are eliminated from the facility, a foam covering will be placed over the 244-CR Vault area after completion of isolation activities.

Other techniques to free blockages could include pressurization, temporary jumpers, and hydraulic scouring. All piping connections are designed to be leak tight and the pit cover block will be installed before pressurization. If pressurization beyond that obtained from the tank farms water system or supply truck (i.e., approximately 150 pounds per square inch gauge) is necessary to remove blockage, an engineering evaluation will be performed to determine the maximum allowable pressure for operation.

Potential emissions calculation used to best represent these activities is the same as decontamination activity calculations presented in Attachment 9.

Excavation*

Excavation may be required to support installation of ventilation, electrical support and waste transfer equipment. Modifications to existing in route pits, vaults and piping and/or to support installation of new waste transfer lines from the 244-CR facility to the identified DST may require excavation. Soil

excavation activities will be performed in accordance with ALARACT Demonstration 5, *TWRS ALARACT Demonstration for Soil Excavation (Using Hand Tools)*, and will follow the radiological controls specified in that ALARACT. Use of heavy equipment will be as necessary.

Any Guzzler excavations in contamination areas will be performed in accordance with the December 18, 1998, WDOH approved Site Wide Guzzler NOC (Air 98-1215), or the most current NOC approved for Guzzler use.

Soil excavation outside the tank farm fence also may be performed with heavy equipment.

Soil will be excavated around the 244-CR vault facility to install new piping, equipment slabs, and new waste transfer system support equipment. It is expected that about 1,000 cubic yards may be excavated, with about 600 cubic yards from inside the tank farm. Backfill will be from the original removed soil or non-contaminated controlled density fill (sand, water and a small amount of cement).

Potential emissions calculation presented in Attachment 11.

Installation of permanent power to 244-CR vault facility

Current power within the 244-CR vault facility is limited. To provide power for new equipment installed under the project, the existing power distribution system will be upgraded. Upgrades may involve modification to the existing Motor Control Center (MCC), installation of equipment control panels, and installation of new conduits.

Installation/operation of passive breather filter assembly*

A compliant passive breather filter will be installed to ventilate the 244-CR facility vaults and tanks once waste transfer activities are completed. The passive breather filters will be installed at two locations in the 244-CR facility. A 1,000 cfm HEPA filter will be installed at the air inlet assembly (previously attached to the evaporative cooler) and a 160 cfm HEPA filter will be installed upstream of the existing HEPA filter pit. Butterfly valves in the ventilation system just downstream of where the filters will be installed may be shut to prevent any emission from the facility during filter installation. Installation of the filters will be performed in accordance with ALARACT Demonstration 16, *TWRS ALARACT Demonstration for Work on Potentially Contaminated Ventilation System Components*. Potential emissions calculation presented in Attachment 12.

5.2.3 Waste transfer and support activities

Operation of a portable exhauster at 244-CR vault for ventilation *

During waste transfer and support activities the tank and vault air space will be actively ventilated by a temporary ventilation system. The temporary ventilation system will consist of a portable exhauster that will be equipped with compliant monitoring and sampling equipment. The purpose of the exhauster is to ensure potential airborne contamination from the pits, cells, or process tanks, is not being released to the environment. Operation of the 1,000 cfm portable exhauster is considered an emissions control (no estimated emissions calculated).

New waste transfer system, waste staging/consolidation*

The planned transfer system may utilize some existing equipment along with installation of new piping and equipment at 244-CR, ER-153 and/or 244-A Lift Station. Maintenance of the transfer system may be required during the waste staging/consolidation. Equipment, which may require on going maintenance includes but is not limited to leak detection and pump system equipment. The waste may be staged/consolidated in one or two of the 244-CR facility tanks (CR-001, CR-002, CR-003 and CR-011) prior to transfer to a DST.

Potential emissions calculation presented in Attachment 7.

6.0 PROPOSED CONTROLS

Potential air emissions for an activity within the 244-CR facility pits, vaults and tanks will be controlled with the use of active ventilation systems. Monitoring will be performed during: sampling, installation/disconnection/repair of new and existing tank/vault equipment, modifications/maintenance to pits, pipes, risers, decontamination activities, removal and disposition of excess equipment, pit cover removal activities, and operation of tank pumping equipment activities. The controls used during the performance of pit activities are based on a graded approach. Pit activities that have an increased potential for air emissions or personnel injury require special controls. Activities including excavation with a low potential for air emissions or personnel injury require less controls. The following general controls are used for the pit activities discussed in this NOC. Activity specific controls are listed in Table 6.1.

General Controls:

1. Pre-job and post-job radiation surveys are performed by radiation protection technicians. Radiation work permits specify permissible occupational radiological limits during activities. Radiation control technicians' survey and release equipment, inspect and approve required containment, and provide radiological surveys to verify compliance to radiation work permit limits.

2. Pit work is shut down (or not initiated) when sustained wind speeds exceed 25 miles per hour as measured in the field and/or reported by the Hanford Meteorological Station.

3. Fixatives may be applied inside the pit (with cover blocks on or off) or accessible portions of the pit decontaminated to less than 100,000 disintegrations per minute/100 square centimeters beta-gamma and 2,000 disintegrations per minute/100 square centimeters alpha.

4. When cover blocks are removed, a fall protection handrail is installed. This handrail is draped in plastic forming a contamination barrier. The plastic extends to the top of the pit and is taped or sealed at the top of the pit. Decontamination of the containment barrier is conducted as required by the job specific radiation work permit.

5. Radiation control technicians monitor the affected work area when the vault foam covering is removed, when jumpers and equipment are being removed from risers and nozzles, and when risers are entered for sampling of tanks and sumps. Jumpers removed from the pit are drained of free liquid and decontaminated or contained before removal. The outer-most container will not exceed 1,000 disintegrations per minute/100 square centimeters beta/gamma and 20 disintegrations per minute/100 square centimeters alpha. If these limits are exceeded, surfaces will be

decontaminated. Disposition of non reusable equipment waste will be performed in accordance with ALARACT Demonstration 4, TWRS ALARACT Demonstration for packaging and transportation of waste.

6. A bullpen designed to minimize the top opening will be used. Pit covers or cover blocks will be removed as necessary. If the bullpen is to be left unattended at any time, a temporary cover is placed over the pit or the pit covers or cover blocks are reinstalled. Two tents will be erected over two pits. Upon completion of the work in the first two 244-CR facility instrumentation pits, the tents will be relocated to the other 244-CR facility instrumentation pits.

7. PTRAEU(s) will actively ventilate the bullpens during activities that require work in the pits (after removal of the cover blocks) to control radiological releases. The PTRAEU(s) will operate intermittently and will be operated in accordance with the latest revision to the WDOH approved. Portable/Temporary Radioactive Air Emission Unit (PTRAEU) NOC (DOE/RL-96-75).

8. A compliant exhauster skid will ventilate the process cells and tanks during waste transfer activities. The exhauster will maintain a negative pressure under the cover blocks and prevent contaminants from reaching the environment. The exhauster skid will be connected to the existing exhaust ductwork with rigid or flexible ductwork.

9. The 1,000 cfm exhauster is equipped with a two-stage HEPA filter, which meets the requirements of ASME AG-1, Section FC and will be tested annually to requirements of ASME N510. The HEPA filters will have an efficiency of 99.95 percent for 0.3-micron median diameter. Each filter housing will meet the applicable sections of ASME N509 and the test requirement of ASME N510. The exhaust stack houses a Generic Effluent Monitoring System (GEMS) that contains an air velocity probe and the air sampling probe.

10. The breather filter will consist of a housing that contains a HEPA filter, an outlet screen, and a small seal loop. Air flowing to and from the 244-CR facility will pass horizontally through the filter and vertically through the downward-facing exit weather hood. Seal loops, installed in the exhaust lines, are designed as a safety feature to prevent unlikely accident in which an over pressurization occurs when the HEPA filter is isolated for occasional (infrequent) maintenance. See Attachment 3 for the typical design of a passive breather filter system.

Table 6-1 Specific Activity Controls

Activity	Controls
Work Area Preparation	
Miscellaneous activities that will not increase emissions above those described in Section 13 of this NOC.	ALARA
Construction and take down open top contaminant tents over the facility vault area	ALARA
Installation of Portable/Temporary Radioactive Air Emission Unit(s) (PTRAEUs)	See General Controls
Installation of portable 1,000 cfm exhauster	ALARACT 16
Removal and/or installation of vault foam covering	ALARACT 4
Application of fixative at pit interior	See General Controls
Temporary power installation	ALARA
Facility/Interim Stabilization Work	

Operation of PTRAEU for bullpen ventilation	Latest WDOH approval, AIR 99-1102, for the Portable/Temporary Radioactive Air Emission Unit (PTRAEU) NOC (DOE/RL-96-75)
Removal and/or installation of pit covers	See General Controls
Inspection of pits, vaults, and tanks	See General Controls
Removal and disposition of excess equipment and waste in pits, risers, and tanks	ALARACT 15, and ALARACT 4
Decontamination activities	See General Controls
Measurement of Liquid level and sludge levels in tanks and sumps	See General Controls
Sampling activities in pits, vaults, and tanks including chemical addition and/or waste sampling to determine Double Shell Tank waste acceptance	ALARACT 7 and ALARACT 1
Facility Equipment Activities: installation, disconnection, repair, replacement, and/or leak testing, of new and existing facility equipment (valves, jumpers, pumps, leak detectors, or other instrumentation/equipment)	ALARACT 4, and ALARACT 15
Modifications, maintenance, and/or isolation and sealing of existing in route pits, vaults and piping (drain and transfer lines) to support and/or installation of new transfer lines	See General Controls
Excavation	ALARACT 5, *and/or* WDOH approved Site Wide Guzzler NOC (Air 98-1215), or the most current NOC approved for Guzzler use.
Installation of permanent power to 244-CR vault facility	ALARA
Installation of passive breather filter assembly	ALARACT 16
Waste transfer and support activities	
Operation of a portable exhauster at 244-CR vault for ventilation	ALARA
New waste transfer system, waste staging/consolidation	See General Controls

7.0 DRAWINGS OF CONTROLS

Process controls are administrative in nature and follow the Hanford Site radiological control and as low as reasonably achievable (ALARA) principles. To support ALARA engineering controls utilized are illustrated in Attachements 1 through 5. Attachment 1 presents a sketch of the 244-CR Vault with the existing ventilation system. A portable exhauster will be used that by-passes 296-C-05. Attachment 2 shows a typical exhauster that will provide active ventilation during activities described in this NOC.

The major system components of a portable exhauster are listed as follows. The abatement technology for the emission unit will undergo routine maintenance, repair, and replacement-in-kind as defined in WAC-246-247-030 (22) and (23)(a) and (b).

- Ductwork
- Isolation valves
- Glycol heaters and associated components

- Demister (34-cubic meter per minute design only)
- 1 prefilter and housing
- 2 HEPA filter test sections
- 2 HEPA filter and filter housing
- 1 exhaust fan
- Stack
- Condensate drain and seal pot system
- Insulation
- Instrumentation and controls
- Electrical system
- Support skid.

Drawing detailing the exhauster stack and monitoring systems components are provided in Attachments 3 and 4 respectively. Components of a typical breather filter are presented in Attachment 5.

8.0 RADIONUCLIDES OF CONCERN

Radionuclides of concern for the 244-CR Vault are presented in Attachment 6. Attachment 6 represent a conservative best basis list of radionuclides associated with tank waste historically received within C Tank Farm in 200 East Area. These radionuclides are judged to be representative of current contamination in the 244-CR facility.

9.0 MONITORING

The monitoring system used on all portable exhausters employed under this NOC meets the regulatory compliance requirements specified in 40 CFR 61, Subpart H and its referenced requirements unless otherwise specified in Section 18 of this NOC.

The system, identified as the generic effluent monitoring system (GEMS) (as seen in Attachment 4), has been subject to extensive testing (PNNL-11701) and shown to meet all applicable regulatory criteria for air sampling at nuclear facilities. The performance criteria addressed both the suitability of the air sampling probe location and the transport of the sample to the collection devices.

The system includes a stack section containing the sample probe and another stack section containing the airflow, and temperature. The GEMS design features a probe with a single shrouded sampling nozzle, a short sample delivery line, and a sample collection system. The collection system includes a filter holder to collect the record sample and an in-line detector head for monitoring beta and gamma radiation-emitting particles. The record sampler will operate continuously during exhauster operation. The beta/gamma sensor could operate continuously in accordance with the authorization basis (HNF-SD-WM-SAR-067), but there is no environmental regulatory requirement to do so. An interlock is installed to shut down the exhaust fan if the beta/gamma sensor detects elevated emissions. Both the record sampler and the beta/gamma sensor will be calibrated and audited routinely.

Attachment 3 show details of the stack and shrouded nozzle, respectively.

For the passive ventilation mode, the periodic confirmatory measurement (PCM) will be conducted annually by verifying the levels of smearable contamination on the inside surface of the ducting downstream of the HEPA filter or on the outside of the screen covering the outlet of the vent, should one exist. Confirmation of levels below 10,000 disintegrations per minute per 100 square centimeters beta/gamma and 200 disintegrations per minute per 100 square centimeters alpha will be used to verify low TEDE. Detected levels above these thresholds would result in further investigation and reporting if

the cause was due to an airborne emission. The radiological survey reports will become the record for the PCM.

In addition to the above described monitoring activity specific monitoring will be utilized;

- Maintaining PTREAU and exhauster records during their usage, including location, start/stop date and time, total hours of operation, and purpose of operation, will provide periodic confirmatory measurement to confirm low TEDE from these sources.

- Continuous radiation control technician coverage is provided while the vault remains open. Monitoring consists of contamination surveys during the pit activities.

- Air samples are taken when a bullpen is occupied and the PTRAEU is operating for those operations described in Section 6.0, for the period just before the cover block is removed and extending through cover block re-installation. Pre-job and post-job surveys also are performed to verify containment.

- Excavation activities will be performed in accordance with ALARACT Demonstration 5, *TWRS ALARACT Demonstration for Soil Excavation (Using Hand Tools)*, and will follow the radiological controls specified in that ALARACT.

10.0 ANNUAL POSSESSION QUANTITIES

The annual possession quantities (APQs) for grouped activities (see Sections 3 and 5) were estimated based on historical data. The release rates were calculated for Waste transfer, Pit cover removal, Decontamination, Facility equipment activities, and Excavation activities. The values were then applied to similar activities, which were best represented by the calculation. For example, the release rate for waste sampling utilizes the pipe cutting calculation. Since both facility equipment activities and sampling activities result in contact with liquid waste it is considered appropriate that this method of calculation be used to represent both activities. Explanations of the calculation for each of the activities are listed below.

As the PTRAEU and portable exhauster are operated in support of the activities for which potential TEDE have been calculated, TEDE specific to the exhausters have not been calculated. All calculations were using HNF-3602, Rev 1, *Calculating Potential-to-Emit Releases and Dose for FEMP and NOCs* guidance and conversion values. The bases of the individual annual possession quantities are as follows.

The calculations for each grouped activities can be found in the attachment listed in parentheses in the section header.

10.1 Waste Transfer (Attachments 6 and 7)

Inventory of radionuclides for the single-shell tanks within the 241-C Tank Farm (Attachment 6) was obtained from the Tank Waste Information Network System 2, as of August 31, 1999. Using the tank volumes contained within the "Waste Tank Summary Report for Month Ending August 31, 1999 (HNF-EP-0182-137), and using the conservative assumption that all radionuclides were in solution, an average weighted concentration was calculated for each isotope. These references were used because they best represent the waste in the 244-CR facility based on the fact that no waste has been transferred to or from the facility since August 1999.The weighted averages were calculated by taking the total curie content of each analyte, and dividing by the total volume of waste from all tanks in the C Farm. The

weighted averages were then multiplied by the volume of waste in the 244-CR facility in gallons (46,500) to derive the APQ. Therefore, the APQ of 6.34E+05 Curie was calculated (Attachment7).

10.2 Pit cover removal (Attachment 8)

The APQ for this activity is based on historical smear data of the inside of the pit cover. The maximum removable contamination reading of 8,000 dpm beta and <20 dpm alpha were used. These values were multiplied with the appropriate unit conversion factors, the total surface area of four pits and a multiplier of ten to include the surface area of equipment in the pits. The APQ for this activity was calculated as 1.50E-03 Curies. The equations used in the calculation are given in the attachment in a line just under each column heading.

10.3 Decontamination (Attachment 9)

The APQ for this activity is based on historical smear data of the inside of the inside of the 244-CR facility pits. The maximum removable contamination reading of 100,000 dpm beta and <20 dpm alpha were used. These values were multiplied with the appropriate unit conversion factors, the total surface area of the pits and a multiplier of ten to account for the surface area of the equipment in the pits. The APQ for this activity was calculated as 1.87E-02 Curies.

The equations used in the calculation are given in the attachment in a line just under each column heading.

10.4 Removal and disposition of excess equipment (Attachment 9)

The APQ calculated for decontamination activities (section 10.3) was used to best represent the APQ for removal and disposition of excess equipment. The APQ for this activity was calculated as 1.87E-02 Curies.

10.5 Facility Equipment Activities (Attachment 10)

The APQ for the facility equipment activities was calculated using a pipe cutting calculation assuming that a section of the pipe to be cut was full of the 244-CR waste. The pipe volume was derived from a 6-inch section of a 6-inch diameter Schedule 40 pipe. The pipe volume was multiplied by the weighted average concentration calculated in Attachment 6. The APQ for this activity was calculated as 4.39E+01 Curies. The equations used in the calculation are given in the attachment in a line just under each column heading.

10.6 Modifications, maintenance and/or isolation of 244-CR facility piping (Attachment 9)

The APQ calculated for decontamination activities (section 10.3) was used to best represent the APQ for modifications, maintenance and/or isolation of 244-CR facility piping. The APQ for this activity was calculated as 1.87E-02 Curies.

10.7 Excavation (Attachment 11)

The APQ for this activity was calculated independent of the excavation method (hand digging or guzzler). To determine APQ, if contamination is encountered as monitored by standard radiological field instrumentation, historical soil measurements inside the C tank farm were used. The average direct probe contamination reading of 800 cpm beta and <10 cpm alpha were used. The beta-gamma contributing radionuclide was assumed to be Sr-90 and the alpha contributing radionuclide was assumed

to be Am-241. These values were multiplied with the appropriate conversion factors and the maximum volume of soil to be excavated. The average soil density was assumed to be 1,570 kilograms per cubic meter. The APQ from soil excavation activities was calculated as 1.89E-02 Curies. The equations used in the calculation are given in the attachment in a line just under each column heading.

10.8 Installation/operation of Passive Breather Filter Assembly (Attachment 12)

Inventory of radionuclides for the single-shell tanks within the 241-C Tank Farm (Attachment 6) was obtained from the Tank Waste Information Network System 2, as of August 31, 1999. Using the estimated waste volume remaining after pumping within the "244-CR Vault Interim Stabilization Project Plan (RPP-6029, Rev 0), a n APQ of 7.37E+04 Curie was calculated (Attachment 12). Credit for the passive breather filter (Flanders G1-F housing with CCF filter) is 160 cfm was not taken in the calculation. The equations used in the calculation are given in the attachment in a line just under each column heading.

11.0 PHYSICAL FORM

All radionuclides listed are present as liquids or particulate solids.

12.0 RELEASE FORM

The release form is radionuclide particulate solids or aerosols.

13.0 RELEASE RATES

The release rates for grouped activities (see Sections 3 and 5) were estimated based on historical data. The release rates were calculated using the APQs previously calculated in section 10 of this NOC. Explanations of the calculation for each of the activities listed below. The calculations for each grouped activities can be found in the attachment listed in parentheses in the section header.

13.1 Waste Transfer (Attachments 6 and 7)

The release rate of 6.80E+02Ci/yr for the waste transfer activities was calculated by multiplying the APQ calculated in Section 10 of this NOC (6.34E+05 Ci) by a partition fraction of 1.0 E-03 (40 CFR 61, Appendix D) (Attachment 5).

13.2 Pit cover removal (Attachment 8)

The release rate of 1.50E-06 Ci/yr for this activity was calculated by multiplying the APQ (1.50E-03 Ci) by a release factor of 1.0E-03 for particulates. The equations used in the calculation are given in the attachment in a line just under each column heading.

13.3 Decontamination (Attachment 9)

The release rate of 1.87E-02 Ci/yr for this activity was calculated by multiplying the APQ (1.87E-02 Ci) by the release factor of 1 for particulates due to the potential use of a high-pressure wash (3,000 psi). The equations used in the calculation are given in the attachment in a line just under each column heading.

13.4 Removal and disposition of excess equipment (Attachment 9)

The release rate calculated for decontamination activities (section 13.3) was used to best represent the release rate for removal and disposition of excess equipment. The release rate for this activity was calculated as 1.87E-02 Ci/yr.

13.5 Facility Equipment Activities (Attachment 10)

The release rate of 1.10E-02 Ci/yr for facility equipment activities was calculated by multiplying the APQ (4.39E+01 Ci) by a release fraction of 1E-03. The potential unabated TEDE from the activities are shown in Attachment 8. The equations used in the calculation are given in the attachment in a line just under each column heading.

13.6 Modifications, maintenance and/or isolation of 244-CR facility piping (Attachment 9)

The release rate calculated for decontamination activities (section 13.3) was used to best represent the release rate for modification, maintenance and/or isolation of 244-CR facility piping. The release rate for this activity was calculated as 1.87E-02 Ci/yr.

13.7 Excavation (Attachment 11)

Separate release rates were calculated based on the method of excavation, hand digging or use of a guzzler. The potential unabated TEDE from manual soil excavation activities are shown in Attachment 11. The equations used in the calculation are given in the attachment in a line just under each column heading.

13.7.1 Manual Excavation

The release rate for manual soil excavation activities was calculated by multiplying the APQ (1.89E-05 Ci) by a release fraction of 1.0E-03. The release rate for manual excavation is 1.89E-02 Ci/yr.

13.7.2 Regulated Guzzler Excavation

The release rate for soil excavation activities using a guzzler was calculated by multiplying the APQ (1.89E-05 Ci) by a release fraction of 1E-03. The release rate for manual excavation is 1.89E-02 Ci/yr.

13.7.3 Installation /operation of Passive Breather Filter Assembly

The release rate for the interim stabilized 244-CR facility was calculated by multiplying the APQ (7.37E+04 Ci) by a release fraction of 1E-03. The release rate for manual excavation is 7.89E+01 Ci/yr.

14.0 LOCATION OF MAXIMALLY EXPOSED INDIVIDUAL

The conservative location of the MEI used for this NOC is the Energy Northwest facility located 20,200 meters east southeast of the 200 East Area.

15.0 TOTAL EFFECTIVE DOSE EQUIVALENT TO THE MAXIMALLY EXPOSED INDIVIDUAL

The total effective dose equivalent (TEDE) for grouped activities (see Sections 3 and 5) were estimated based on historical data. The release rates were calculated in Section 13 of this NOC for Waste transfer, Pit cover removal, Decontamination, Facility equipment activities, and Excavation activities. The values were then applied similar to activities, which were best represented by the calculation.

15.1 Waste Transfer (Attachments 6 and 7)

Multiplying the release rates for each nuclide times the appropriate offsite dose factor and summing the individual contributions, the TEDE of 4.39E+01 mrem/yr for this activity was calculated. The potential unabated and abated TEDE from the activities are shown in Attachment 5. The abated TEDE for this activity is 1.33E-05 mrem/yr. The equations used in the calculation are given in the attachment in a line just under each column heading.

15.2 Pit cover removal (Attachment 8)

Multiplying the release rates for each nuclide times the appropriate offsite dose factor and summing the individual contributions, the TEDE of 2.13E-07 mrem/yr for this activity was calculated. The potential unabated TEDE from the activities are shown in Attachment8. The abated TEDE for this activity is equal to the unabated because no credit was given for TEDE control equipment in the bullpen. The equations used in the calculation are given in the attachment in a line just under each column heading.

15.3 Decontamination (Attachment 9)

Multiplying the release rates for each nuclide times the appropriate offsite dose factor and summing the individual contributions, the TEDE of 2.11E-03 mrem/yr for this activity was calculated. The potential unabated TEDE from the activities are shown in Attachment 9. The abated TEDE for this activity is equal to the unabated because no credit was given for TEDE control equipment in the bullpen. The equations used in the calculation are given in the attachment in a line just under each column heading.

15.4 Removal and disposition of excess equipment (Attachment 9)

The TEDE calculated for decontamination activities (section 15.3) was used to best represent the TEDE for removal and disposition of excess equipment. The TEDE for this activity was calculated as 2.11E-03 mrem/yr. The abated TEDE for this activity is equal to the unabated because no credit was given for TEDE control equipment in the bullpen.

15.5 Facility Equipment Activities (Attachment 10)

Multiplying the release rates for each nuclide times the appropriate offsite dose factor and summing the individual contributions, the TEDE of 7.08E-04 mrem/yr for this activity was calculated. The potential unabated TEDEs from the activities are shown in Attachment 10. The abated TEDE for this activity is equal to the unabated because no credit was given for TEDE control equipment in the bullpen. The equations used in the calculation are given in the attachment in a line just under each column heading.

15.6 Modifications, maintenance and/or isolation of 244-CR facility piping (Attachment 9)

The TEDE calculated for decontamination activities (section 15.3) was used to best represent the TEDE for modifications, maintenance and/or isolation of 244-CR facility piping. The TEDE for this activity was calculated as 2.11E-03 mrem/yr.

15.7 Excavation (Attachment 11)

Separate TEDEs were calculated based on the method of excavation, hand digging or use of a guzzler.

15.7.1 Manual Excavation

Multiplying the release rates for each nuclide times the appropriate offsite dose factor and summing the individual contributions, the TEDE of 8.34E-05 mrem/yr for this activity was calculated. The potential unabated TEDEs from the activities are shown in Attachment 11. The abated TEDE for this activity is equal to the unabated because no credit was given for TEDE control equipment in the bullpen.The equations used in the calculation are given in the attachment in a line just under each column heading.

15.7.2 Regulated Guzzler Excavation

Multiplying the release rates for each nuclide times the appropriate offsite dose factor and summing the individual contributions, the TEDE of 8.34E-02 mrem/yr for this activity was calculated. The potential unabated TEDEs from the activities are shown in Attachment 11. The abated TEDE for this activity is equal to the unabated because no credit was given for TEDE control equipment in the bullpen. The equations used in the calculation are given in the attachment in a line just under each column heading.

15.7.3 Installation /operation of Passive Breather Filter Assembly

Multiplying the release rates for each nuclide times the appropriate offsite dose factor and summing the individual contributions, the TEDE of 5.10E+00 mrem/yr for this activity was calculated. The potential unabated TEDEs from the activities are shown in Attachment 12. The abated TEDE for this activity is equal to the unabated because no credit was given for TEDE control equipment in the bullpen. The equations used in the calculation are given in the attachment in a line just under each column heading.

16.0 COST FACTOR IF NO ANALYSIS

The pit work described in this NOC will represent a non-significant modification to an existing facility as noted in Section 3.0. The controls proposed in Section 6.0 are consistent with the Hanford Site radiation control and ALARA principles, and are proposed as representing ALARA control technology.

17.0 DURATION OR LIFETIME

The work described in this NOC is scheduled to be completed by December 31, 2005.

18.0 STANDARDS

The potential TEDE received by the offsite hypothetical highest receptor, resulting from the proposed operations at these emission units is greater than 0.1 mrem per year. During active ventilation, two types of exhaust ventilation systems will be utilized. First a PTRAEU(s) will be used to ventilate bullpens

during pre-waste transfer activities and a portable exhauster during waste transfer and support operations. The emissions control equipment employed on the PTRAEU(s) will adhere to the compliance standards as noted in Table 18-1, while the portable exhauster will adhere to the compliance standards as noted in Table 18-2. These tables summarizes the compliance of emission control equipment with the listed technology standards for facilities with a potential to emit greater than 0.1 millirem per year TEDE to the MEI as discussed in Sections 9.0 and 13.0. This section discusses compliance with major sections of these standards and provides justification to support adequacy of the design for sections of these standards which are not met.

The required standards applied include:

- AG-1; This equipment specific code consists of five primary sections, which are applicable to this unit. The applicable sections are fans (Section BA), ductwork (Section SA), HEPA filter housing (Section HA), HEPA filters (Section FC), dampers (Section DA), heaters (Section CA) and Quality Assurance (QA) (Section AA).
- ASME/ANSI N509
- ASME/ANSE N510
- ANSI/ASME NQA-1
- 40 CFR 61.93 (b) (3)
- ANSI N13.1
- 40 CFR 52, Appendix E
- 40 CFR 60, Appendix A:Test Methods: 1, 1A, 2, 2A, 2C, 2D, 4, 5 and 17

Table 18-1. Emission Control Equipment Standards Compliance for PTRAEU

Standard	Does design comply	Notes
ASME/ANSI AG-1	No	The quality assurance section of AG-1 relies on ASME NQA-1. The general QA criteria are located in Section AA. Specific component/system criteria are located in each section throughout AG-1. The portable exhauster was built here on site and meets the site's QA program. This includes procurement of the safety material/components, along with appropriate pedigree from an evaluated supplier, tracking and maintaining the material/components after it arrived on site, inspection of the material/components, and witnessing the testing. Based on the above, the AG-1 criteria is met. AG-1 contains several other sections, however they do not apply to this system. Finally, several sections of AG-1 are not yet completed.
ASME/ANSI N509	No	Some units are cylindrical HEPA filters, which are not addressed by this standard. Performance testing of these HEPA filters to demonstrate adequacy of design and testing is addressed by compliance with ASME/ANSI N510.
ASME/ANSE N510	No	Documentation to show full compliance with the standard cannot be provided. The single HEPA filter on the ventilator unit cannot be aerosol tested per N510 criteria. However, the HEPA filters are

		tested in-place to meet the intent of ASME/ANSI N510. The systems are tested annually in accordance with site procedures. The current method for testing the filter is proceduralized (procedure available upon request) and includes injecting an aerosol upstream before the filter and sampling upstream and downstream of the filter for penetration. A measurement is taken to determine the amount of aerosol challenging the upstream face of the HEPA filter. This establishes the 100 percent baseline point to accurately determine penetration through the HEPA filter. Considering the intended service these units are providing, and because only one HEPA filter is used, this test is considered an acceptable method to verify HEPA filter integrity.
ANSI/ASME NQA-1	No/Yes	Quality assurance addressed by current version of HNF-MP-599 "Project Hanford Quality Assurance Program Description"
ANSI N13.1	N/A	There are no sampling systems on these units.
40 CFR 60, Appendix A Test Methods: 1, 1A, 2, 2A, 2C, 2D, 4	N/A	Flow measurement is performed for filter efficiency as related to ASME N510.
40 CFR 60, Appendix A Test Methods: 5 and 17	N/A	

Table 18-2. Emission Control Equipment Standards Compliance for Portable Exhausters

Standard	Does design comply	Notes
ASME/ANSI AG-1	Yes	The quality assurance section of AG-1 relies on ASME NQA-1. The general QA criteria are located in Section AA. Specific component/system criteria are located in each section throughout AG-1. The portable exhauster was built here on site and meets the site's QA program. This includes procurement of the safety material/components, along with appropriate pedigree from an evaluated supplier, tracking and maintaining the material/components after it arrived on site, inspection of the material/components, and witnessing the testing. This equipment specific code consists of five primary sections, which are applicable to this unit. The applicable sections are fans (Section BA), ductwork (Section SA), HEPA filter housing (Section HA), HEPA filters (Section FC), dampers (Section DA), heaters (Section CA) and Quality Assurance (QA) (Section AA). AG-1 contains several other sections, however they do not apply to this system. The fan section of AG-1 (Section BA) covers the construction and testing requirements for fans. This fan meets the applicable criteria identified in AG-1, except as identified below. It was constructed to the Air Movement and Control Association (AMCA) 99-401, Spark Resistant Construction, criteria, and was tested to the applicable sections of AMCA 210. However, it can not be shown the shaft leakage criteria is met (Section BA 4142.2). This is acceptable because a "stuffing box" is installed around the shaft to minimize the

		leakage, and the leakage point is located after the HEPA filters. The next applicable requirement is the ductwork section of AG-1 (Section SA). As was the case for the fan, this section identifies several requirements for ductwork. This includes acceptable material, fabrication, and testing criteria. The ductwork used will be a combination of both metal and flexible polymer. In both cases it does meet the applicable criteria and will be pressure tested per the applicable criteria identified in AG-1 and N510 prior to operation The HEPA filter housing section (Section HA) was recently released and this section has taken the place of the requirements identified in N509. After reviewing the requirements identified in Section HA against the portable exhauster design, the portable exhauster filter housings are in compliance. The HEPA filter section of AG-1 (Section FC) is also applicable in this instance. The criteria identified in AG-1 were previously located in military specification 51068 and ASME 509. The filters, which will be installed in the exhauster, will meet the applicable sections of AG-1, except for two areas dealing with filter qualification testing. Justification for this exception was discussed with and approved by WDOH at the December, 1998 Routine Technical Assistance Meeting. The dampers installed on the portable exhauster do meet the applicable AG-1 criteria. This includes design, construction and testing. The manufacturer performed a leak test on the valves, and a pressure decay test was also completed on the exhaust train system. For the pressure decay test, the valves were used for isolation. The test was successful. The heater installed in the portable exhauster meets the requirements of AG-1, Section CA. The heater relies on a glycol mixture that is heated by a separate heating unit, similar to a hot water tank. The heated glycol is then pumped through the heating coil located inside the exhaust system. The reason for this type of design is to allow this system to be used in a flammable gas environment. It would be very expensive and space consuming to rely on an electric heater to satisfy the flammable gas requirements. By using a glycol heater, there are no electrical, sparking or energized components in contact with the air stream. In addition, controls are in place to prevent the damage of the HEPA filters if the coil were to fail. This includes level detection in the glycol reservoir, which will detect the loss of glycol. Also, differential pressure across the first HEPA filter is monitored. If the coil were to break, the differential pressure across the first HEPA would increase and the system would be shutdown.
ASME/ANSI N509	Yes	This standard deals with the individual components and how they relate to the overall system. The major sections of N509 have been replaced with those identified in AG-1. There are certain sections that are still applicable, such as Section 4.3, which discusses the maximum flow rate for the system not to exceed the lowest maximum

		rating of any component installed in the system. This is being met, along with the other applicable sections of N509. (see AG-1)
ASME/ANSE N510	Yes	This standard pertains to the testing of nuclear air cleaning systems. The first requirement identified in N510 is to perform a pressure decay test. This is to assure there are no infiltration or outward leak paths from the system. This test was completed on the portable exhauster and was successful. This system meets the leak test criteria identified per N510. Test sections are located in the exhaust train to allow for proper independent testing of both HEPA filters.
ANSI/ASME NQA-1	Yes	NQA-1 was met for the system design, procurement and construction. Either the material and components were purchased from a supplier having a quality assurance program equivalent to NQA-1, or the supplier was evaluated and was on the Hanford Evaluated Suppliers List (ESL), or dedication was performed on the materials and components that were purchased from manufacturers not having a quality assurance program.
40 CFR 61.93 (b) (3)	Yes	
ANSI N13.1	NA	Shrouded probe via alternate method allowed per EPA (1994) The sampling system for the portable exhausters meets the intent of N13.1 (1999). A shrouded probe is used for particulate sampling and the probe and configuration has been tested in accordance with the standard. A splitter is installed directly after the probe, which routes the sample to both the record sample and continuous air monitor. Both branches are equipped with flow measuring and control instruments.
40 CFR 52, Appendix E	No	The exhausters are designed to meet the intent of the requirement. A 168 hour test will be performed. The exhauster is fitted with a variable frequency drive (VFD) controllers for the unit fans to maintain specified airflow with in specified tolerance. Because of this the Orientation Sensitivity test results will not demonstrate compliance directly. Compliance is based on the design of the unit.
40 CFR 60, Appendix A Test Methods: 1, 1A, 2, 2A, 2C, 2D, 4	Yes/No	Method 1: This method is not applicable to these portable exhausters because the exhaust stack diameter is < 12 inches Method 1A: This method is being used and is identical to method 1, except it is for stack diameters < 12 inches. Method 2: This method is not used because the S pitot tube is used for the larger stacks (i.e., diameter > 12 inches). Method 2A: This section applies to volume meters and therefore, does not apply for this application. The method being used for flow measurement is a standard pitot tube measuring the static pressure and total pressure, then converting that information over to a corresponding velocity pressure. That is then converted into a velocity. Method 2C: This method is used and a standard pitot tube is used for

		the measuring. The other sections of Method 2 applicable to a standard pitot tube are also relied upon. Method 2D: This method is not used for these systems. This method relies upon a rotameter, orifice or similar device. The method being used in our application is method 2C relying upon a pitot tube. Method 4: This method is not used. However, instead a humidity probe is used to determine moisture content of the stream. The humidity value determined from this instrument is mathematically incorporated into the final flow rate measurement.
40 CFR 60, Appendix A Test Methods: 5, 17	NA	Methods 5 and 17: This method is not relied upon, rather ANSI N13.1 (1999) was relied upon for the sampling system.

Table 18-3. Emission Control Equipment Standards Compliance for Breather Filters

Standard	Does design comply	Notes
ASME/ANSI AG-1	No	Filters installed meet AG-1. Housing were fabricated prior to AG-1
ASME/ANSI N509	No/Yes	Open face design does not meet N509. G-1 housing design meets N509.
ASME/ANSE N510	Yes	The Flander/CSC G-1 housing design meets N509/N510. Periodic filter aerosol testing.
ANSI/ASME NQA-1	Yes/No	Site QA Program RPP-MP-600.
ANSI N13.1	NA	Not required for periodic confirmatory measurement. Confirmatory measurements will include smears.
40 CFR 52, Appendix E	NA	Not required for periodic confirmatory measurement. Confirmatory measurements will include differential pressure, periodic filter aerosol testing, and filter housing radiological surveys.
40 CFR 60, Appendix A Test Methods: 1, 1A, 2, 2A, 2C, 2D, 4	NA	Filter testing required for air flow related to ASME N510. Other methods not required because emission collection and measurement is not required.
40 CFR 60, Appendix A Test Methods: 5 and 17	N/A	These methods are for sampling system designs. Periodic confirmatory measurements will be taken via smears in lieu of a sampling system.

19.0 CONDITIONS AND CLARIFICATIONS

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REFERENCES

Current revisions used for all references unless otherwise stated.

AIR 98-1215, letter, Allen W. Conklin, State of Washington Department of Health to James E. Rasmussen, U.S. Department qf Energy, Richland Operations Office, December 18, 1998.

AIR 99-507, letter, Allen W. Conklin, State of Washington Department of Health to James E. Rasmussen, U.S. Department of Energy, Richland Operations Office, May 19, 1999.

ANSI N13.1, *Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities*, American National Standards Institute, New York, New York.

ANSI N509, *Nuclear Power Plant Air Cleaning Units and Components*, American National Standards Institute, New York, New York.

ANSI N509, *Testing of Nuclear Air Treatment Systems*, American National Standards Institute, New York, New York.

DOE-HDBK-3010-94, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities.*

DOE/RL-96-75, *Radioactive Air Emissions Notice of Construction Portable/Temporary Radioactive Air Emissions Units.*

HNF-EP-0182-137, *Waste Tank Summary Report for Month ending August 31, 1999.*

HNF-MP-599, *Project Hanford Quality Assurance Program Description.*

HNF-0528, *National Emission Standards for Hazardous Air Pollutants (NESHAP) Quality Assurance Project Plan for Radioactive Air Emissions.*

HNF-3602, *Calculating Potential-to-Emit Releases and Dose for FEMP and NOCs.*

HNF-4327, *Control of Airborne Radioactive Emissions for Frequently Performed TWRS Work Activities (ALARACT Demonstrations)*

WAC 246-247, *Washington Administrative Code, Radiation Protection – Air Emissions.*

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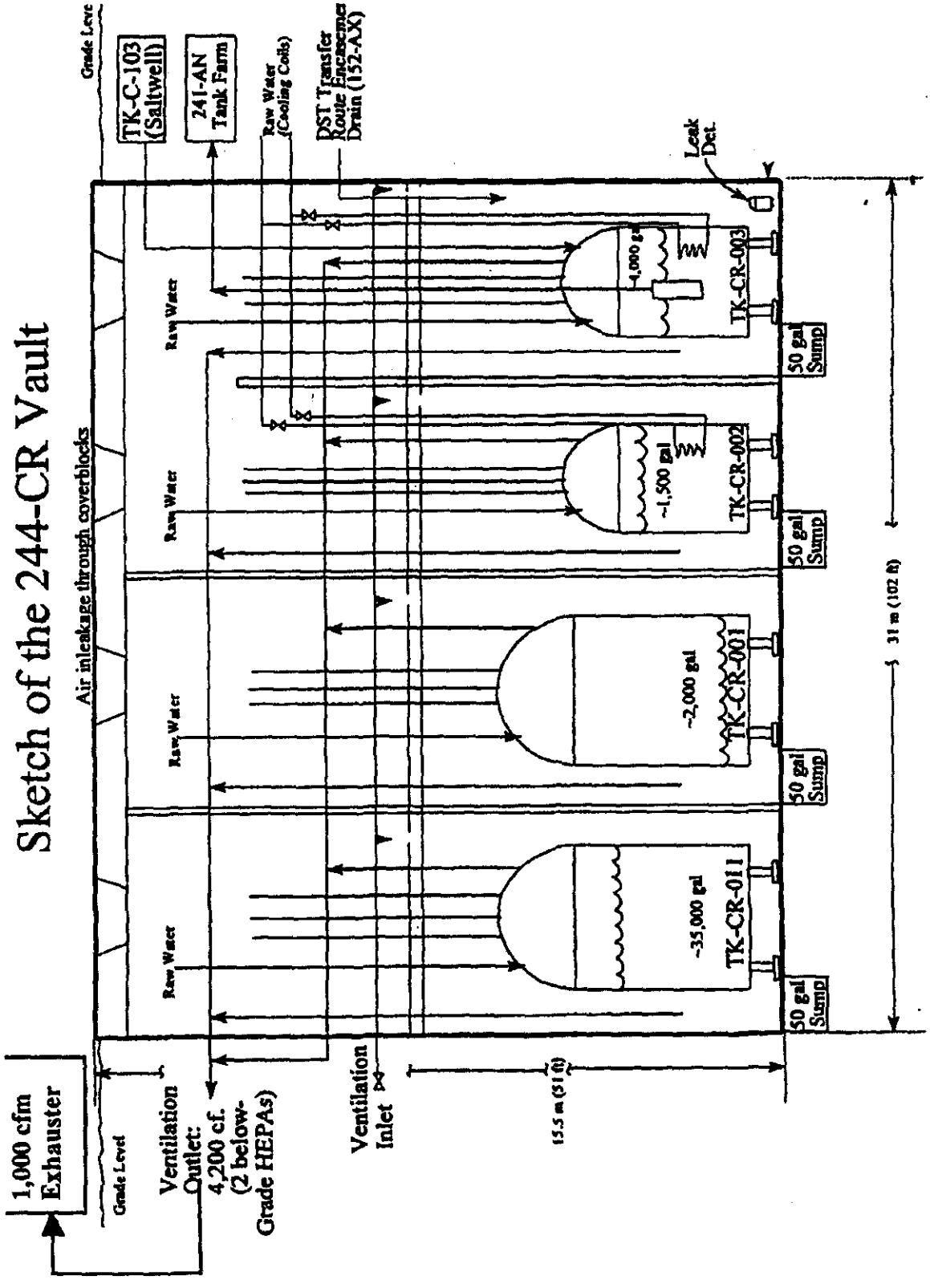
ATTACHMENT 1

244-CR VAULT


Sketch of the 244-CR Vault
Grade Level
TK-C-103 (Saltwell)
241-AN Tank Farm
Raw Water (Cooling Coils)
PST Transfer Route Encasement Drain (152-AX)
Leak Det.
Air inleakage through coverblocks
Raw Water
~4,000 gal
TK-CR-003
~1,500 gal
TK-CR-002
~2,000 gal
TK-CR-001
~35,000 gal
TK-CR-011
50 gal Sump
31 m (102 ft)
1,000 cfm Exhauster
Grade Level
Ventilation Outlet: 4,200 cf. (2 below-Grade HEPAs)
Ventilation Inlet
15.5 m (51 ft)

1
2

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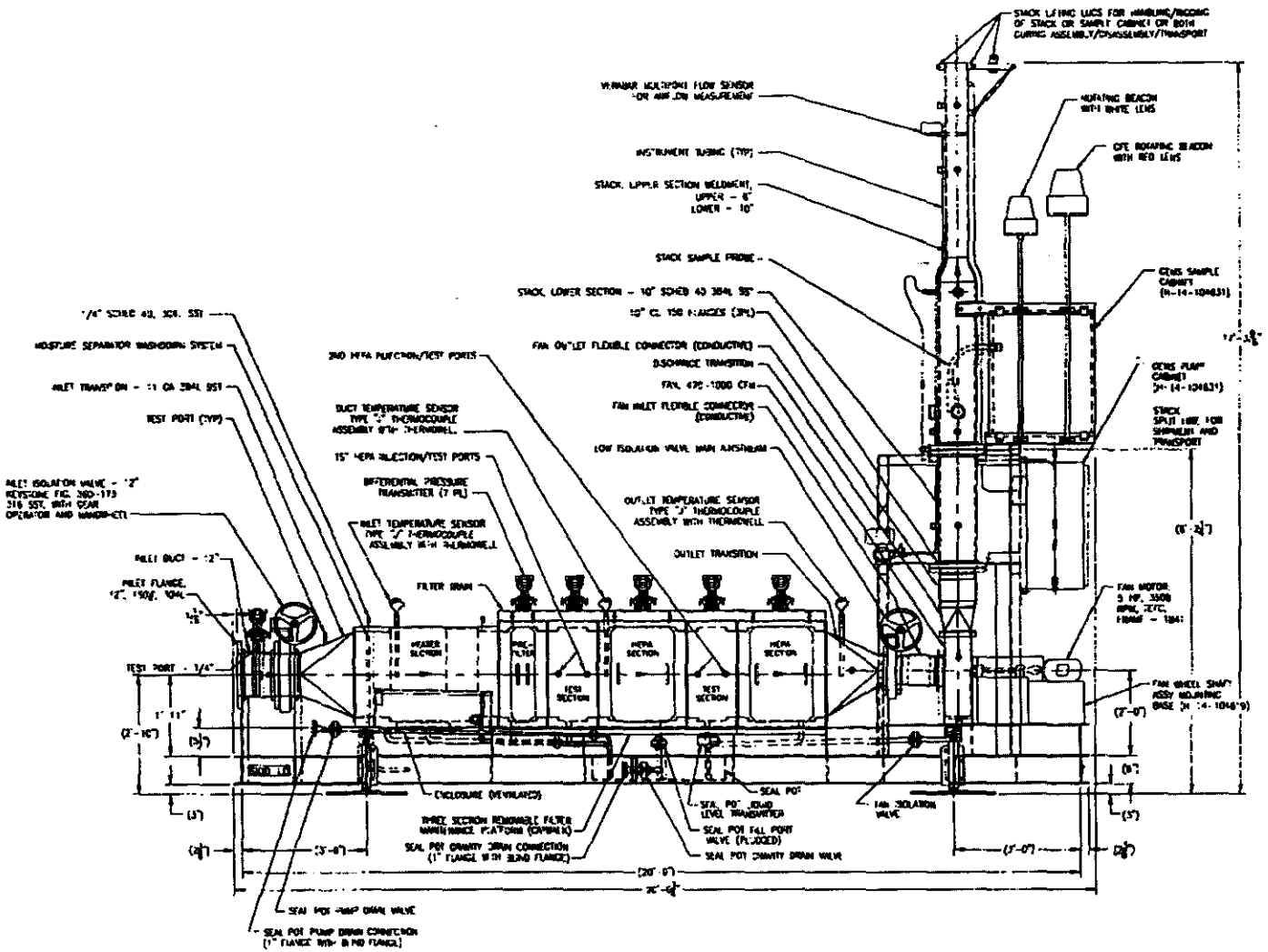
ATTACHMENT 2

TYPICAL PORTABLE EXHAUSTER

Typical Portable Exhauster.



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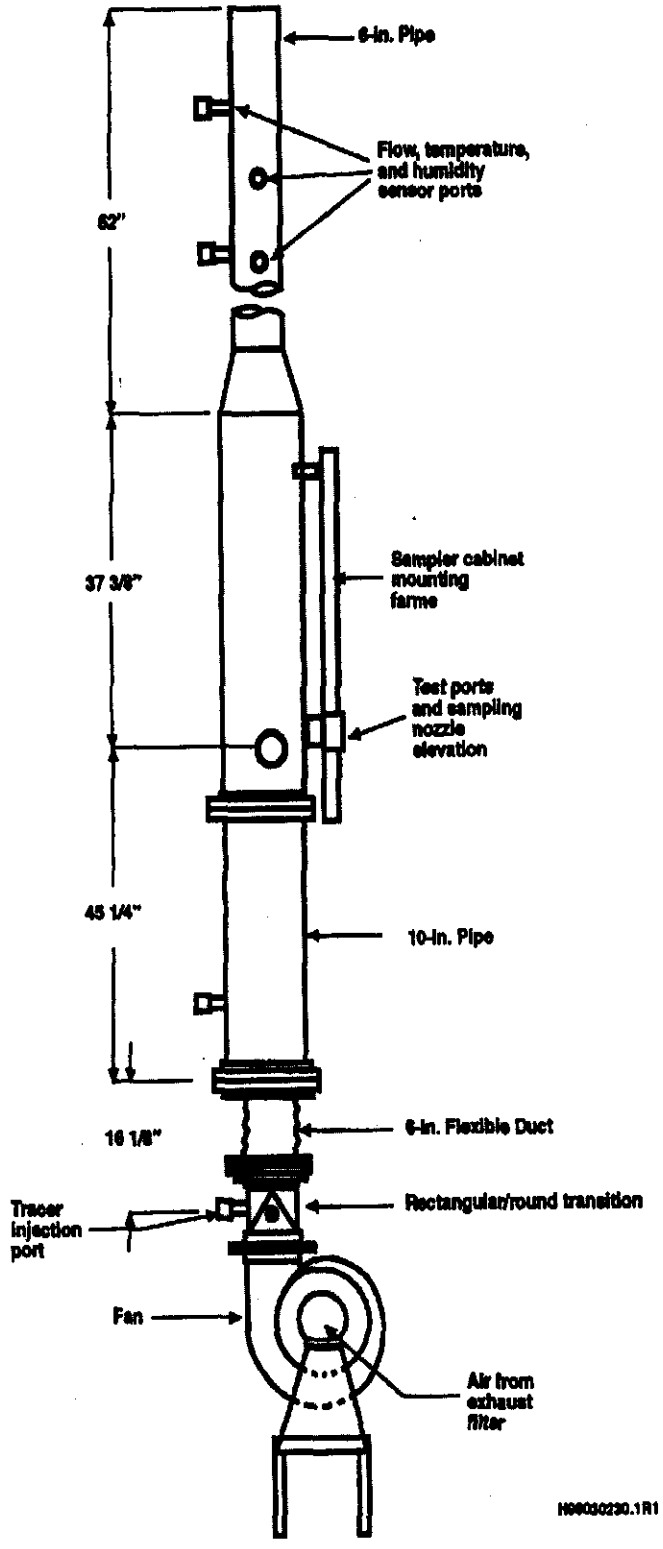
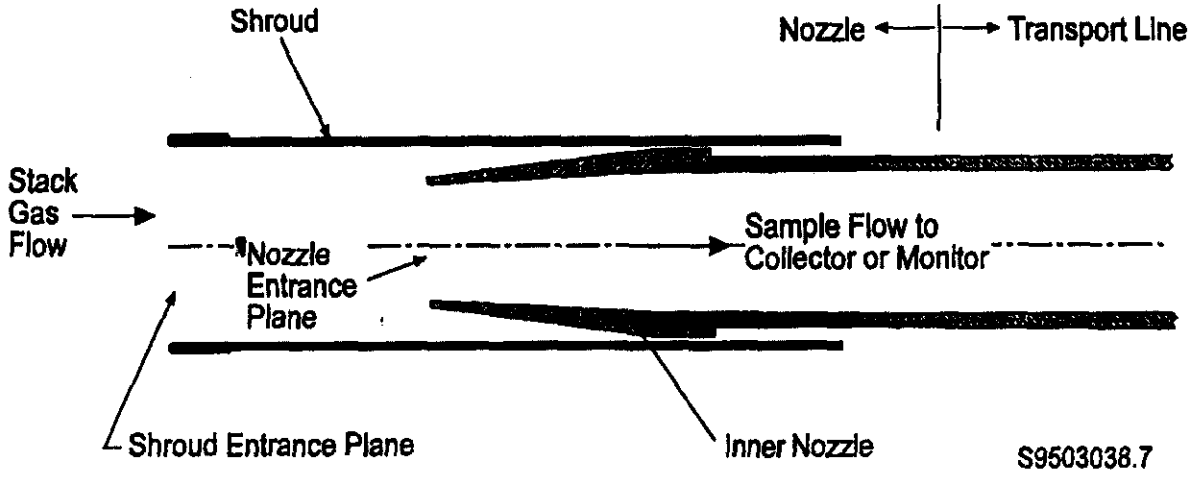
ATTACHMENT 3

TYPICAL EXHAUSTER STACK

Typical Stack



Typical Shrouded Nozzle



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ATTACHMENT 4

TYPICAL GEMS

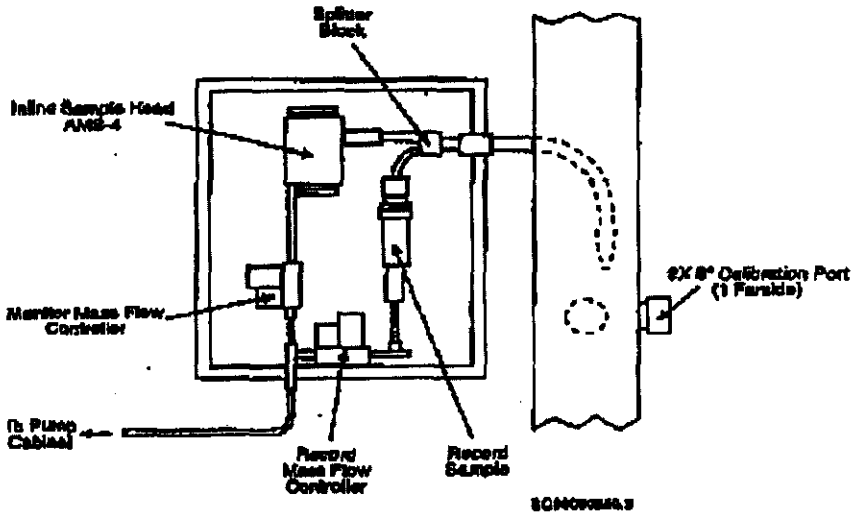

Figure 2. GEMS Sampling Cabinet

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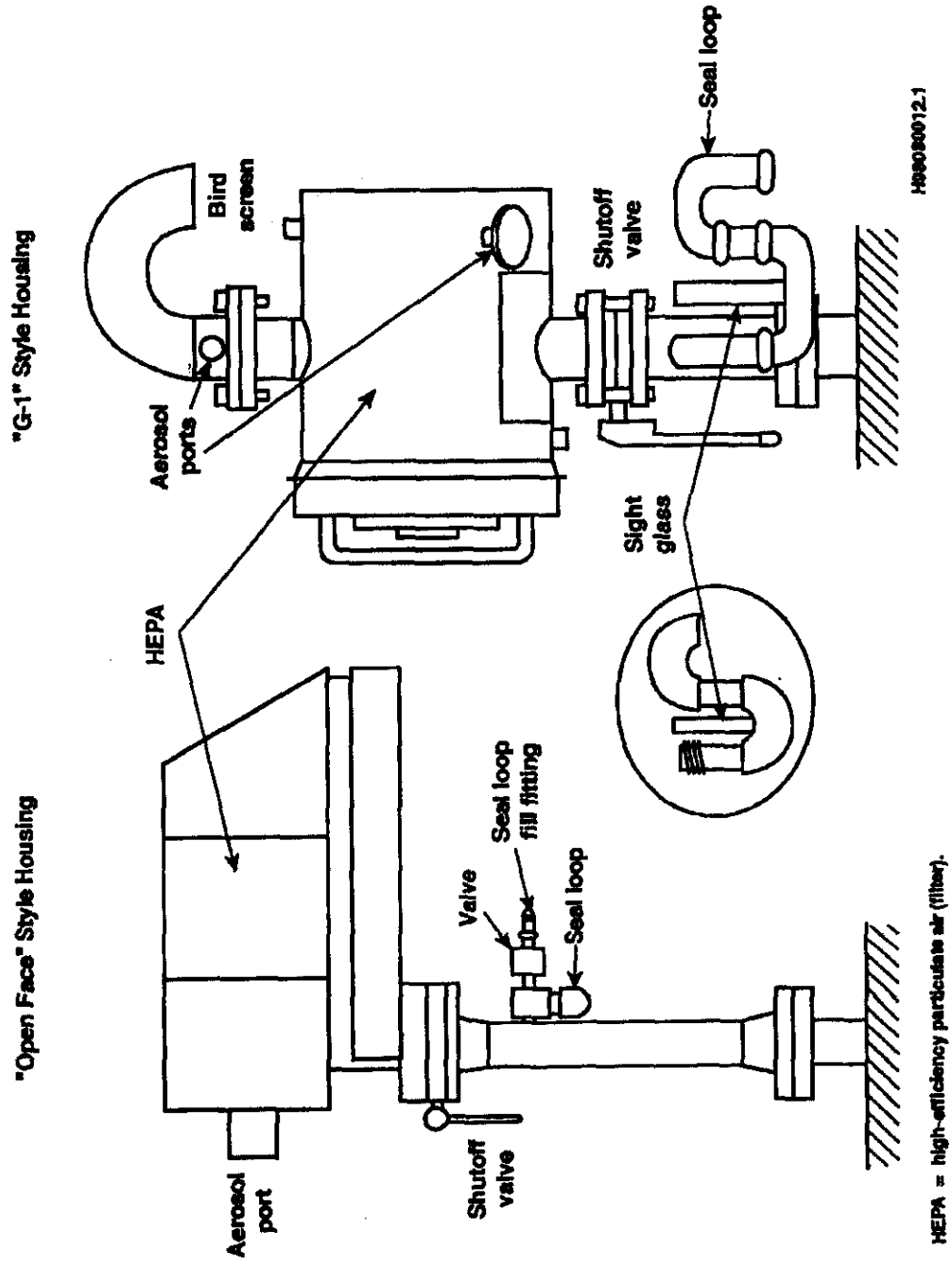
ATTACHMENT 5

TYPICAL BREATHER FILTER COMPONENTS

Typical Breather Filter Components



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ATTACHMENT 6

C TANK FARM TANK INVENTORY AND WEIGHTED AVERAGE CONCENTRATION

	Units	C-101	C-102	C-103	C-104	C-105	C-106	C-107	C-108	C-109
Volume	Gallons	88,000	316,000	198,000	295,000	135,000	107,000	257,000	66,000	66,000
	Liters	333,520	1,197,640	750,420	1,118,050	511,650	405,530	974,030	250,140	250,140
CALC		A	B	C	D	E	F	G	H	I
Analyte										
3H	curie	4.27E-01	1.46E+00	3.19E+01	1.02E+01	5.92E-01	5.75E+00	6.64E+00	4.12E-01	2.05E+00
14C	curie	8.91E-02	2.11E-01	4.40E-01	1.18E+00	9.30E-01	2.30E-01	5.95E-01	6.78E-02	5.69E-03
59Ni	curie	1.76E-02	4.09E-02	1.07E+01	2.63E+01	2.40E-02	7.79E+01	4.62E+01	5.35E-01	4.93E+00
60Co	curie	2.84E-02	5.00E+02	1.10E+03	4.15E+02	1.32E+02	4.24E+02	7.54E+02	1.47E-02	3.30E-02
63Ni	curie	1.63E+00	4.02E+00	1.05E+03	2.59E+03	2.27E+00	7.68E+03	4.55E+03	4.82E+01	4.68E+02
79Se	curie	1.32E-02	4.42E-02	5.34E+00	1.51E+01	1.79E-02	1.85E+01	2.57E+01	1.43E-02	5.76E-02
90Y	curie	1.07E+03	1.82E+05	1.98E+06	6.30E+05	3.65E+05	4.77E+06	1.67E+06	9.45E+03	2.21E+05
90Sr	curie	1.07E+03	1.82E+05	1.98E+06	6.30E+05	3.65E+05	4.77E+06	1.67E+06	9.45E+03	2.21E+05
93mNb	curie	5.11E-02	1.40E-01	2.28E+01	6.55E+01	8.46E-02	7.77E+01	1.11E+02	6.80E-02	2.62E-01
93Zr	curie	6.24E-02	1.87E-01	2.01E+01	5.57E+01	6.81E-02	7.03E+01	9.54E+01	5.75E-02	2.21E-01
99Tc	curie	4.34E-01	1.23E+00	2.13E+02	3.10E+01	9.81E+01	2.21E+02	1.05E+02	4.70E-01	3.06E+01
106Ru	curie	1.78E-05	8.96E-04	2.63E-03	1.14E-01	5.48E-07	3.19E-01	1.99E-01	5.58E-09	6.60E-05
113mCd	curie	1.87E-01	7.63E-01	3.03E+01	1.49E+02	2.86E-01	5.65E+01	2.37E+02	1.62E-01	6.60E-01
125Sb	curie	8.51E-02	0.00E+00	3.71E+01	9.20E+00	8.88E-02	1.73E+03	6.22E+00	1.31E-02	5.47E-02
126Sn	curie	2.00E-02	6.15E-02	8.64E+00	2.42E+01	2.76E-02	3.02E+01	4.14E+01	2.15E-02	8.99E-02
129I	curie	8.25E-04	2.57E-03	4.00E-02	1.57E-02	1.07E-01	1.00E-02	7.81E-03	8.85E-04	1.54E-03
134Cs	curie	4.46E-03	1.20E-01	1.93E+00	7.34E-01	2.27E-03	7.02E-01	7.45E-01	3.36E-03	1.23E-02
137Cs	curie	1.73E+03	6.25E+04	7.80E+04	1.03E+05	1.25E+05	2.67E+05	3.06E+04	9.07E+04	2.37E+05
137mBa	curie	1.64E+03	5.91E+04	7.40E+04	9.74E+04	1.18E+05	2.53E+05	2.89E+04	8.58E+04	2.24E+05
151Sm	curie	4.85E+01	1.29E+02	2.03E+04	5.63E+04	6.48E+01	7.11E+04	9.63E+04	5.33E+01	2.16E+02
152Eu	curie	1.68E-01	1.03E+00	8.46E+00	1.49E+01	1.45E-01	5.67E+01	2.41E+01	1.36E-01	2.52E+00
154Eu	curie	5.72E-01	9.05E+01	6.40E+03	1.54E+03	9.95E-01	2.30E+03	3.42E+03	2.58E-01	1.76E+00

155Eu	curie	1.20E+01	9.15E+01	5.40E+03	9.24E+02	8.58E+00	2.12E+03	3.35E+03	1.03E+01	1.67E+02
226Ra	curie	4.01E-06	7.53E-04	6.98E-04	4.88E-03	2.28E-06	3.85E-03	3.11E-03	4.21E-06	2.64E-04
228Ra	curie	5.09E-03	5.39E+00	3.66E-03	6.94E+01	1.18E-05	1.90E-02	3.92E-02	2.14E-05	1.29E-03
227Ac	curie	1.56E-02	1.77E+01	5.10E-02	2.22E+01	2.45E-10	3.02E-04	7.54E-03	5.27E-10	2.39E-09
229Th	curie	2.31E-03	1.59E-01	1.22E-03	4.93E-01	4.78E-08	1.42E-04	3.42E-03	1.02E-07	4.45E-07
232Th	curie	2.37E-04	3.21E-02	5.48E-03	1.25E+02	2.77E-05	1.89E-02	5.83E-02	4.62E-05	1.05E-04
231Pa	curie	2.31E-02	2.97E+01	5.98E-03	1.23E+00	2.03E-11	3.25E-05	3.51E-04	1.96E-11	3.31E-11
232U	curie	8.89E-02	8.68E-01	1.02E-01	1.47E+01	8.87E-05	6.04E-03	3.28E-02	5.76E-07	1.48E-05
233U	curie	3.45E-01	3.37E+00	3.91E-01	5.63E+01	2.98E-06	2.33E-02	1.28E-01	3.44E-08	8.80E-07
234U	curie	1.41E+00	5.44E+00	1.12E+00	1.36E+01	1.69E+00	4.59E-01	1.28E+00	4.85E-02	1.23E+00
235U	curie	6.07E-02	2.26E-01	4.77E-02	5.36E-01	7.21E-02	1.96E-02	5.71E-02	2.16E-03	5.53E-02
236U	curie	2.46E-02	1.52E-01	2.05E-02	6.00E-01	2.93E-02	8.16E-03	1.23E-02	3.10E-04	7.93E-03
238U	curie	8.55E+00	5.17E+00	1.37E-01	2.79E-02	3.60E-03	9.57E-02	1.45E-02	2.89E-03	9.63E-02
237Np	curie	2.78E-03	8.93E-03	7.41E+01	2.07E+02	6.24E+00	1.16E+02	3.82E+01	1.21E-02	2.16E+00
238Pu	curie	1.40E+00	1.70E+02	1.14E+00	1.15E+01	1.73E+00	4.69E-01	1.29E+00	4.91E-02	1.24E+00
239Pu	curie	4.16E+02	5.88E+03	4.48E+03	4.70E+03	3.98E+02	2.37E+03	1.15E+03	3.08E+00	9.22E+01
240Pu	curie	6.97E+01	1.08E+03	6.91E+02	9.26E+02	6.09E+01	4.85E+02	2.09E+02	1.99E-01	1.50E+01
241Pu	curie	6.65E+02	1.31E+04	9.10E+02	6.78E+03	7.69E+02	1.12E+03	1.60E+03	1.15E-01	4.45E+01
242Pu	curie	2.07E-03	0.00E+00	5.38E+03	1.40E+04	4.54E+02	8.17E+03	2.77E+03	2.62E-01	1.56E+02
241Am	curie	5.49E+02	1.45E+03	1.19E+00	6.25E+00	8.73E+00	1.76E+00	1.34E+00	2.47E-03	7.72E-02
243Am	curie	4.81E-03	1.37E-01	2.15E-02	8.16E-02	1.73E-03	5.17E-02	1.45E-02	1.05E-06	7.65E-04
242Cm	curie	9.56E+00	2.90E+01	2.11E-02	3.50E-01	7.21E-03	5.89E-02	8.39E-02	7.92E-07	1.06E-03
243Cm	curie	2.24E-01	2.64E+00	7.58E-02	5.74E-01	2.06E-01	7.49E-01	1.21E-01	5.05E-05	4.03E-03
244Cm	curie	1.80E-01	5.88E+01	5.23E-01	2.20E+01	3.46E-01	1.86E+01	4.92E+00	1.86E-05	1.94E-03

Continued

	Units	C-110	C-111	C-112	C-201	C-202	C-203	C-204	Sum	Percentage of Total Inventory	Weighted Average Concentration (curies/gallon)	Weighted Average Concentration (curies/liter)
Volume	Gallons	178,000	57,000	104,000	2,000	1,000	5,000	3,000	4.62E+05			
	Liters	674,620	216,030	394,160	7,580	3,790	18,950	11,370	1.83E+06			
CALC		J	K	L	M	N	O	P	Q = Sum (A through P)	R = Q/(Sum of Q)	S = Q/(sum of gallons)	R = Q/(sum of liters)
Analyte												
3H	curie	1.07E+00	1.66E-01	2.81E+01	4.41E-03	8.19E-04	1.52E-02	8.00E-03	3.18E+01	0.00%	6.60E-05	1.74E-05
14C	curie	3.16E-01	3.15E-02	2.73E+00	1.14E-02	1.13E-03	4.24E-02	2.18E-02	3.23E+00	0.00%	6.70E-06	1.77E-06
59Ni	curie	1.75E-02	2.24E-01	9.40E+00	4.23E-01	4.23E-01	4.24E-01	4.23E-01	1.68E+01	0.00%	3.49E-05	9.20E-06
60Co	curie	8.55E-03	9.09E-03	4.58E-02	1.36E-03	1.19E-03	1.90E-03	1.54E-03	1.17E-01	0.00%	2.43E-07	6.41E-08
63Ni	curie	1.53E+00	2.02E+01	9.21E+02	4.15E+01	4.15E+01	4.15E+01	4.15E+01	1.62E+03	0.02%	3.37E-03	8.90E-04
79Se	curie	1.34E+00	6.64E-03	2.39E-01	5.21E-03	4.94E-03	6.01E-03	5.48E-03	1.68E+00	0.00%	3.48E-06	9.19E-07
90Y	curie	4.69E+03	1.17E+06	1.25E+06	1.70E+04	1.46E+04	9.32E+03	3.76E+02	2.70E+06	41.00%	5.59E+00	1.48E+00
90Sr	curie	4.69E+03	1.17E+06	1.25E+06	1.70E+04	1.46E+04	9.32E+03	3.76E+02	2.70E+06	41.00%	5.59E+00	1.48E+00
93mNb	curie	6.15E-02	3.15E-02	2.04E-01	2.31E-02	2.18E-02	2.69E-02	2.43E-02	7.23E-01	0.00%	1.50E-06	3.96E-07
93Zr	curie	5.30E-02	2.64E-02	1.72E-01	1.95E-02	1.84E-02	2.28E-02	2.06E-02	6.11E-01	0.00%	1.27E-06	3.35E-07
99Tc	curie	3.41E+01	2.19E-01	7.97E+01	1.68E-02	7.95E-03	4.33E-02	2.56E-02	1.45E+02	0.00%	3.01E-04	7.95E-05
106Ru	curie	2.01E-10	6.59E-08	1.16E-05	9.41E-06	9.42E-06	9.40E-06	9.41E-06	1.15E-04	0.00%	2.39E-10	6.31E-11
113mCd	curie	1.25E-01	8.15E-02	5.09E-01	5.87E-02	5.62E-02	6.65E-02	6.13E-02	1.78E+00	0.00%	3.69E-06	9.75E-07
125Sb	curie	4.61E-03	1.35E-02	5.60E-02	4.66E-03	4.57E-03	4.95E-03	4.76E-03	1.61E-01	0.00%	3.34E-07	8.81E-08
126Sn	curie	1.92E-02	1.00E-02	6.56E-02	8.28E-03	7.88E-03	9.47E-03	8.68E-03	2.41E-01	0.00%	4.99E-07	1.32E-07
129I	curie	7.90E-04	4.13E-04	2.40E-03	3.18E-05	1.54E-05	8.12E-05	4.83E-05	8.20E-03	0.00%	1.29E-08	3.40E-09
134Cs	curie	7.32E-05	1.64E-03	2.03E-02	4.52E-06	4.42E-06	4.82E-06	4.62E-06	3.77E-02	0.00%	7.82E-08	2.06E-08
137Cs	curie	1.86E+04	1.21E+04	2.46E+05	1.76E+02	9.16E+01	3.18E+02	1.34E+02	6.05E+05	9.20%	1.26E+00	3.31E-01
137mBa	curie	1.76E+04	1.15E+04	2.33E+05	1.67E+02	8.68E+01	3.01E+02	1.27E+02	5.73E+05	8.71%	1.19E+00	3.13E-01
151Sm	curie	4.88E+01	2.46E+01	1.61E+02	1.95E+01	1.85E+01	2.26E+01	2.05E+01	5.85E+02	0.01%	1.21E-03	3.20E-04

152Eu	curie	5.99E-03	4.09E-02	7.38E-01	3.25E-01	3.25E-01	3.26E-01	3.25E-01	4.74E+00	0.00%	9.84E-06	2.60E-06
154Eu	curie	1.15E-01	1.80E-01	6.30E+02	1.91E-01	1.89E-01	1.98E-01	1.93E-01	6.33E+02	0.01%	1.31E-03	3.47E-04
155Eu	curie	9.05E-01	2.89E+00	8.25E+02	2.12E+01	2.12E+01	2.13E+01	2.13E+01	1.09E+03	0.02%	2.26E-03	5.97E-04
226Ra	curie	5.50E-06	1.88E-06	4.71E-05	3.72E-05	3.68E-05	3.88E-05	3.78E-05	4.73E-04	0.00%	9.82E-10	2.59E-10
228Ra	curie	2.77E-05	9.57E-06	2.10E-03	1.81E-04	1.80E-04	1.85E-04	1.82E-04	4.18E-03	0.00%	8.67E-09	2.29E-09
227Ac	curie	8.15E-11	1.31E-10	6.11E-04	2.09E-10	2.06E-10	2.19E-10	2.12E-10	6.11E-04	0.00%	1.27E-09	3.34E-10
229Th	curie	1.57E-08	2.54E-08	2.77E-04	3.79E-08	3.73E-08	3.97E-08	3.85E-08	2.78E-04	0.00%	5.76E-10	1.52E-10
232Th	curie	5.78E-05	2.06E-05	2.89E-03	6.06E-06	4.86E-06	9.67E-06	7.27E-06	3.15E-03	0.00%	6.53E-09	1.72E-09
231Pa	curie	1.91E-11	8.83E-12	2.85E-05	6.65E-13	2.69E-13	1.86E-12	1.06E-12	2.85E-05	0.00%	5.91E-11	1.56E-11
232U	curie	8.25E-06	2.97E-05	2.33E-01	8.44E-09	2.65E-08	1.53E-08	6.41E-09	2.33E-01	0.00%	4.84E-07	1.28E-07
233U	curie	4.94E-07	1.33E-06	9.03E-01	5.05E-10	6.97E-10	9.15E-10	3.84E-10	9.03E-01	0.00%	1.87E-06	4.94E-07
234U	curie	6.96E-01	1.39E+00	1.20E+01	7.12E-04	3.80E-04	1.29E-03	5.41E-04	1.54E+01	0.00%	3.19E-05	8.41E-06
235U	curie	3.13E-02	6.20E-02	5.28E-01	3.20E-05	1.60E-05	5.80E-05	2.43E-05	6.79E-01	0.00%	1.41E-06	3.72E-07
236U	curie	4.44E-03	1.24E-02	1.49E-01	4.55E-06	8.84E-06	8.23E-06	3.45E-06	1.74E-01	0.00%	3.61E-07	9.53E-08
238U	curie	2.55E-03	1.35E-03	3.47E-01	7.71E-05	2.41E-05	2.36E-04	1.30E-04	4.51E-01	0.00%	9.35E-07	2.47E-07
237Np	curie	2.38E-01	3.23E+00	5.54E+00	2.93E+00	7.63E-01	6.98E-01	9.16E-03	1.56E+01	0.00%	3.23E-05	8.53E-06
238Pu	curie	7.04E-01	1.42E+00	1.22E+01	7.21E-04	3.77E-04	1.31E-03	5.46E-04	1.56E+01	0.00%	3.24E-05	8.55E-06
239Pu	curie	7.46E+01	2.10E+02	6.00E+01	1.24E+02	3.22E+01	2.96E+01	3.87E-01	6.26E+02	0.01%	1.30E-03	3.43E-04
240Pu	curie	4.40E+00	3.17E+01	9.53E+00	2.04E+01	5.30E+00	4.85E+00	6.36E-02	9.14E+01	0.00%	1.90E-04	5.01E-05
241Pu	curie	2.13E-02	1.19E-01	2.19E+02	4.18E+01	1.09E+01	9.96E+00	1.31E-01	3.27E+02	0.00%	6.77E-04	1.79E-04
242Pu	curie	2.81E+00	2.34E+02	8.27E+01	2.12E+02	5.51E+01	5.04E+01	6.61E-01	7.94E+02	0.01%	1.65E-03	4.35E-04
241Am	curie	2.40E-05	1.71E-03	9.70E-02	6.73E-02	1.75E-02	1.60E-02	2.10E-04	2.79E-01	0.00%	5.80E-07	1.53E-07
243Am	curie	8.60E-06	8.93E-04	3.01E-04	1.04E-03	2.71E-04	2.48E-04	3.25E-06	3.53E-03	0.00%	7.33E-09	1.93E-09
242Cm	curie	5.96E-06	9.56E-07	5.00E-03	1.00E-03	2.61E-04	2.39E-04	3.13E-06	7.56E-03	0.00%	1.57E-08	4.14E-09
243Cm	curie	3.56E-07	3.75E-05	3.51E-02	3.69E-03	9.61E-04	8.79E-04	1.15E-05	4.48E-02	0.00%	9.29E-08	2.45E-08
244Cm	curie	9.12E-07	3.80E-05	8.42E-01	1.79E-03	4.67E-04	4.27E-04	5.60E-06	8.47E-01	0.00%	1.76E-06	4.63E-07
								Sum	6.58E+06	100.00%	1.36E+01	3.60E+00

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ATTACHMENT 7

TOTAL ANNUAL POSSESSION QUANTITY, ESTIMATED INVENTORY, AND EMISSIONS FOR THE 244-CR

1

2440CR Waste Volume (WV)		46,500	gallons
# HEPA Filters (HF)	2		
HEPA Filter Efficiency (FE)	99.95%		
Release Fraction for liquids (RF)		1.00E-03	40 CFR 61, Appendix D

Analyte	Weighted Average Concentration (curies/gallon)	Possession Quantity (Ci)	Unabated Release (Ci)	Offsite Dose Factor CAP88PC (mrem/Ci)*	Unabated Offsite Dose (mrem/yr)	Percent of Offsite Dose	Abated Release (Ci)**	Offsite Dose Factor CAP88PC (mrem/Ci)*	Abated Offsite Dose (mrem/yr)
	A	B = A*WV	C =B*RF	D	E =C*D	F =E/(sum of E)	G =C*(1-FE)^HF	H	I =G*H
3H	6.60E-05	3.07E+00	3.07E-03	2.5E-05	7.68E-08	0.00%	7.68E-10	2.5E-05	1.92E-14
14C	6.70E-06	3.11E-01	3.11E-04	1.9E-03	5.92E-07	0.00%	7.78E-11	1.9E-03	1.48E-13
59Ni	3.49E-05	1.62E+00	1.62E-03	3.1E-04	5.02E-07	0.00%	4.05E-10	3.1E-04	1.26E-13
60Co	2.43E-07	1.13E-02	1.13E-05	2.5E-01	2.82E-06	0.00%	2.82E-12	2.5E-01	7.06E-13
63Ni	3.37E-03	1.57E+02	1.57E-01	2.6E-04	4.08E-05	0.00%	3.92E-08	2.6E-04	1.02E-11
79Se	3.48E-06	1.62E-01	1.62E-04	1.3E-01	2.11E-05	0.00%	4.05E-11	1.3E-01	5.26E-12
90Y	5.59E+00	2.60E+05	2.60E+02	3.4E-04	8.84E-02	0.20%	6.50E-05	3.4E-04	2.21E-08
90Sr	5.59E+00	2.60E+05	2.60E+02	1.1E-01	2.86E+01	65.13%	6.50E-05	1.1E-01	7.15E-06
93mNb	1.50E-06	6.98E-02	6.98E-05	2.1E-03	1.46E-07	0.00%	1.74E-11	2.1E-03	3.66E-14
93Zr	1.27E-06	5.90E-02	5.90E-05	1.3E-03	7.67E-08	0.00%	1.47E-11	1.3E-03	1.92E-14
99Tc	3.01E-04	1.40E+01	1.40E-02	2.3E-02	3.22E-04	0.00%	3.50E-09	2.3E-02	8.05E-11
106Ru	2.39E-10	1.11E-05	1.11E-08	1.6E-02	1.78E-10	0.00%	2.78E-15	1.6E-02	4.45E-17
113mCd	3.69E-06	1.72E-01	1.72E-04	1.3E-01	2.23E-05	0.00%	4.29E-11	1.3E-01	5.58E-12
125Sb	3.34E-07	1.55E-02	1.55E-05	2.6E-02	4.03E-07	0.00%	3.88E-12	2.6E-02	1.01E-13
126Sn	4.99E-07	2.32E-02	2.32E-05	4.7E-02	1.09E-06	0.00%	5.80E-12	4.7E-02	2.73E-13
129I	1.29E-08	5.99E-04	5.99E-07	2.0E-01	1.20E-07	0.00%	1.50E-13	2.0E-01	2.99E-14
134Cs	7.62E-06	3.54E-03	3.54E-06	1.0E-01	3.54E-07	0.00%	9.09E-13	1.0E-01	9.09E-14
137Cs + D	1.26E+00	5.84E+04	5.84E+01	2.4E-01	1.40E+01	31.89%	1.46E-05	2.4E-01	3.50E-06
137mBa	1.19E+00	5.52E+04	5.52E+01	5.3E-13	2.93E-11	0.00%	1.38E-05	5.3E-13	7.32E-18
151Sm	1.21E-03	5.64E+01	5.64E-02	7.5E-04	4.23E-05	0.00%	1.41E-08	7.5E-04	1.06E-11
152Eu	9.84E-06	4.57E-01	4.57E-04	2.4E-01	1.10E-04	0.00%	1.14E-10	2.4E-01	2.74E-11
154Eu	1.31E-03	6.11E+01	6.11E-02	2.0E-01	1.22E-02	0.03%	1.53E-08	2.0E-01	3.05E-09
155Eu	2.26E-03	1.05E+02	1.05E-01	8.0E-03	8.42E-04	0.00%	2.63E-08	8.0E-03	2.11E-10
226Ra	9.82E-10	4.57E-05	4.57E-08	4.6E-01	2.10E-08	0.00%	1.14E-14	4.6E-01	5.25E-15
228Ra	8.67E-09	4.03E-04	4.03E-07	1.9E-01	7.66E-08	0.00%	1.01E-13	1.9E-01	1.91E-14
227Ac	1.27E-09	5.89E-05	5.89E-08	1.5E+01	8.84E-07	0.00%	1.47E-14	1.5E+01	2.21E-13
229Th	5.76E-10	2.68E-05	2.68E-08	1.6E+01	4.29E-07	0.00%	6.70E-15	1.6E+01	1.07E-13
232Th	6.53E-09	3.04E-04	3.04E-07	8.0E+00	2.43E-06	0.00%	7.59E-14	8.0E+00	6.07E-13
231Pa	5.91E-11	2.75E-06	2.75E-09	1.2E+01	3.30E-08	0.00%	6.87E-16	1.2E+01	8.25E-15
232U	4.84E-07	2.25E-02	2.25E-05	1.1E+01	2.47E-04	0.00%	5.62E-12	1.1E+01	6.18E-11

233U	1.87E-06	8.71E-02	8.71E-05	3.1E+00	2.70E-04	0.00%	2.16E-11	3.1E+00	6.75E-11
234U	3.19E-05	1.48E+00	1.48E-03	3.1E+00	4.60E-03	0.01%	3.71E-10	3.1E+00	1.15E-09
235U	1.41E-06	6.55E-02	6.55E-05	3.0E+00	1.96E-04	0.00%	1.64E-11	3.0E+00	4.91E-11
236U	3.61E-07	1.68E-02	1.68E-05	2.9E+00	4.87E-05	0.00%	4.20E-12	2.9E+00	1.22E-11
238U	9.35E-07	4.35E-02	4.35E-05	2.8E+00	1.22E-04	0.00%	1.09E-11	2.8E+00	3.04E-11
237Np	3.23E-05	1.50E+00	1.50E-03	1.2E+01	1.80E-02	0.04%	3.76E-10	1.2E+01	4.51E-09
238Pu	3.24E-05	1.51E+00	1.51E-03	7.6E+00	1.14E-02	0.03%	3.77E-10	7.6E+00	2.86E-09
239Pu	1.30E-03	6.04E+01	6.04E-02	6.2E+00	4.95E-01	1.13%	1.51E-08	6.2E+00	1.24E-07
240Pu	1.90E-04	8.82E+00	8.82E-03	8.2E+00	7.23E-02	0.16%	2.21E-09	8.2E+00	1.81E-08
241Pu	6.77E-04	3.15E+01	3.15E-02	1.3E-01	4.10E-03	0.01%	7.86E-09	1.3E-01	1.02E-09
242Pu	1.65E-03	7.66E+01	7.66E-02	7.8E+00	5.97E-01	1.36%	1.91E-08	7.8E+00	1.49E-07
241Am	5.80E-07	2.70E-02	2.70E-05	1.3E+01	3.50E-04	0.00%	6.74E-12	1.3E+01	8.76E-11
243Am	7.33E-09	3.41E-04	3.41E-07	1.3E+01	4.43E-06	0.00%	8.52E-14	1.3E+01	1.11E-12
242Cm	1.57E-08	7.30E-04	7.30E-07	4.1E-01	2.99E-07	0.00%	1.82E-13	4.1E-01	7.48E-14
243Cm	9.29E-08	4.32E-03	4.32E-06	8.5E+00	3.67E-05	0.00%	1.08E-12	8.5E+00	9.18E-12
244Cm	1.76E-06	8.17E-02	8.17E-05	6.7E+00	5.47E-04	0.00%	2.04E-11	6.7E+00	1.37E-10
Total	13.8444042	6.34E+05	6.34E+02		4.39E+01	100.00%	1.59E-04		1.10E-05

Notes

* Fluor Hanford, 2002, *Calculating Potential-to-Edmit Release and Dose for FEMP and NOCs*, HNF-3602, Rev 1, Richland, Washington.

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ATTACHMENT 8

EMISSIONS AND DOSE ASSOCIATED WITH 244-CR PIT COVER REMOVAL

1

Emissions and Dose Associated with 244-CR Pit Cover Removal

Release Fraction (RF)	1.00E-03			
Area of Individual Pit	8.31E+05	cm^2	8.95E+02	ft^2
Total Surface Area of for pits (TSA)	4.16E+06	cm^2		
Multiplyer (estimated entries) (M)	10			

Smear Sample Calculations	Max Smear Removable Concentration (dpm/100 cm2)*	Conversion (dpm/100cm^2) to (Ci/cm^2)	Max Smear Concentration (Ci/cm^2)	Possession Quantity (Ci)	Unabated Release (Ci/yr)	Abated Release (Ci/yr)**	Offsite Dose Factor (mrem/Ci) a	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr)**
	A	B	C = A*B	D =(TSA)*C*(M)	E =RF*D	F =RF*D	G	H = E*G	I = F*G
Alpha (Am-241)	20	4.50045E-15	9.00E-14	3.74E-06	3.74E-09	3.74E-09	13	4.86E-08	4.86E-08
Beta (Sr-90)	8,000	4.50045E-15	3.60E-11	1.50E-03	1.50E-06	1.50E-06	0.11	1.65E-07	1.65E-07
Total				1.50E-03	1.50E-06	1.50E-06		2.13E-07	2.13E-07

Notes:

[a] HNF-3602, Rev 1, Calculating Potential-to-Emit Releases and Doses for FEMPs and NOCs. The Offsite Dose Factor is an annual quantity.

(*) source RSR # E304013 (1/15/98)

** No credt was taken for the use of the 1000cfm PTRAEU in the bullpen during this operation because of the open top of the bullpen and the volume of the pen.

** There is no emissons contol equipment. Abated and unabated values are equal.

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ATTACHMENT 9

EMISSIONS AND DOSE ASSOCIATED WITH DECONTAMINATION ACTIVITIES

Emissions and Dose Associated with 244-CR Decontamination Activities

Release Fraction (RF)	1.00E+00			
Total Surface Area of 6 pit (TSA)	4.16E+06	cm^2		
Area of individual Pit	8.31E+05	cm^2	8.95E+02	ft^2
Multiplier (to account for surface area of equipment in pits) (M)	10			

Smear Sample Calculations	Max Smear Removable Concentration (dpm/100 cm2)*	Conversion (dpm/100cm^2) to (Ci/cm^2)	Max Smear Concentration (Ci/cm^2)	Possession Quantity (Ci)	Unabated Release (Ci/yr)	Abated Release (Ci) c	Offsite Dose Factor (mrem/Ci)	Unabated Dose (mrem/yr)	Abated Dose (mrem/yr) c
	A	B	C = A*B	D =(TSA)*C*(M)	E =RF*D	F =RF*D	G	H = E*G	I = F*G
Alpha (Am-241)	20	4.50045E-15	9.00E-14	3.74E-06	3.74E-06	3.74E-06	13	4.86E-05	4.86E-05
Beta (Sr-90)	100,000	4.50045E-15	4.50E-10	1.87E-02	1.87E-02	1.87E-02	0.11	2.06E-03	2.06E-03
Total				1.87E-02	1.87E-02			2.11E-03	2.11E-03

Notes

* source RSR # E30336 (10/17/97)

[a] multiplier used to estimate increase in surface area to account for equipment in pits based on a review of pit information (video, drawings, etc)

[b] HNF-3602, Rev 1, Calculating Potential-to-Emit Releases and Doses for FEMPs and NOCs

[c] There is no emissons contol equipment. Abated and unabated values are equal.

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ATTACHMENT 10

POTENTIAL UNABATED EMISSIONS AND DOSE FOR FACILITY EQUIPMENT ACTIVITIES

POTENTIAL UNABATED EMISSIONS AND DOSE FOR PIPE CUTTING ACTIVITIES

6 INCH, SCH 40 PIPE	6.07	inch diameter
Area of pipe interior = 3.14r^2	28.88	in^2
TOTAL PIPE VOLUME (TPV) (six linear inches of pipe)	2.84	liters
Release Fraction* (RF)	1.00E-03	
Conversion in^3 to Liters	1.64E-02	
Conversion gallons to liters	3.79E+00	

Analyte	Weighted Average Concentration (curies/gallon)	Weighted Average Concentration (curies/liter)	Pipe Inventory (Ci)	Unabated Release (Ci/yr)	Offsite Dose Factor (mrem/Ci) a	Offsite Unabated Dose (mrem/yr)	Percent of Unabated Offsite Dose	Abated Release (Ci/yr)	Offsite Dose Factor (mrem/Ci) a	Abated Dose (mrem/yr)
	A	B =A*(1/GL)	C =B*TPV	D =C*RF	E	F =D*E	G =F/(sum of F)	H =C*RF	I	J =H*I
3H	6.60E-05	1.74E-05	4.95E-05	4.95E-08	2.5E-05	1.24E-12	0.00%	4.95E-08	2.5E-05	1.24E-12
14C	6.70E-06	1.77E-06	5.02E-06	5.02E-09	1.9E-03	9.54E-12	0.00%	5.02E-09	1.9E-03	9.54E-12
59Ni	3.49E-05	9.20E-06	2.61E-05	2.61E-08	3.1E-04	8.10E-12	0.00%	2.61E-08	3.1E-04	8.10E-12
60Co	2.43E-07	6.41E-08	1.82E-07	1.82E-10	2.5E-01	4.55E-11	0.00%	1.82E-10	2.5E-01	4.55E-11
63Ni	3.37E-03	8.90E-04	2.53E-03	2.53E-06	2.6E-04	6.57E-10	0.00%	2.53E-06	2.6E-04	6.57E-10
79Se	3.48E-06	9.19E-07	2.61E-06	2.61E-09	1.3E-01	3.40E-10	0.00%	2.61E-09	1.3E-01	3.40E-10
90Y	5.59E+00	1.48E+00	4.19E+00	4.19E-03	3.4E-04	1.43E-06	0.20%	4.19E-03	3.4E-04	1.43E-06
90Sr	5.59E+00	1.48E+00	4.19E+00	4.19E-03	1.1E-01	4.61E-04	65.13%	4.19E-03	1.1E-01	4.61E-04
93mNb	1.50E-06	3.96E-07	1.12E-06	1.12E-09	2.1E-03	2.36E-12	0.00%	1.12E-09	2.1E-03	2.36E-12
93Zr	1.27E-06	3.35E-07	9.51E-07	9.51E-10	1.3E-03	1.24E-12	0.00%	9.51E-10	1.3E-03	1.24E-12
99Tc	3.01E-04	7.95E-05	2.26E-04	2.26E-07	2.3E-02	5.19E-09	0.00%	2.26E-07	2.3E-02	5.19E-09
106Ru	2.39E-10	6.31E-11	1.79E-10	1.79E-13	1.6E-02	2.87E-15	0.00%	1.79E-13	1.6E-02	2.87E-15
113mCd	3.69E-06	9.75E-07	2.77E-06	2.77E-09	1.3E-01	3.60E-10	0.00%	2.77E-09	1.3E-01	3.60E-10
125Sb	3.34E-07	8.81E-08	2.50E-07	2.50E-10	2.6E-02	6.50E-12	0.00%	2.50E-10	2.6E-02	6.50E-12
126Sn	4.99E-07	1.32E-07	3.74E-07	3.74E-10	4.7E-02	1.76E-11	0.00%	3.74E-10	4.7E-02	1.76E-11

129I	1.29E-08	3.40E-09	9.65E-09	9.65E-12	2.0E-01	1.93E-12	0.00%	9.65E-12	2.0E-01	1.93E-12
134Cs	7.82E-08	2.06E-08	5.86E-08	5.86E-11	1.0E-01	5.86E-12	0.00%	5.86E-11	1.0E-01	5.86E-12
137Cs + D	1.26E+00	3.31E-01	9.41E-01	9.41E-04	2.4E-01	2.26E-04	31.89%	9.41E-04	2.4E-01	2.26E-04
137mBa	1.19E+00	3.13E-01	8.91E-01	8.91E-04	5.3E-13	4.72E-16	0.00%	8.91E-04	5.3E-13	4.72E-16
151Sm	1.21E-03	3.20E-04	9.10E-04	9.10E-07	7.5E-04	6.82E-10	0.00%	9.10E-07	7.5E-04	6.82E-10
152Eu	9.84E-06	2.60E-06	7.38E-06	7.38E-09	2.4E-01	1.77E-09	0.00%	7.38E-09	2.4E-01	1.77E-09
154Eu	1.31E-03	3.47E-04	9.85E-04	9.85E-07	2.0E-01	1.97E-07	0.03%	9.85E-07	2.0E-01	1.97E-07
155Eu	2.26E-03	5.97E-04	1.70E-03	1.70E-06	8.0E-03	1.36E-08	0.00%	1.70E-06	8.0E-03	1.36E-08
226Ra	9.82E-10	2.59E-10	7.36E-10	7.36E-13	4.6E-01	3.39E-13	0.00%	7.36E-13	4.6E-01	3.39E-13
228Ra	8.67E-09	2.29E-09	6.50E-09	6.50E-12	1.9E-01	1.23E-12	0.00%	6.50E-12	1.9E-01	1.23E-12
227Ac	1.27E-09	3.34E-10	9.50E-10	9.50E-13	1.5E+01	1.43E-11	0.00%	9.50E-13	1.5E+01	1.43E-11
229Th	5.76E-10	1.52E-10	4.32E-10	4.32E-13	1.6E+01	6.91E-12	0.00%	4.32E-13	1.6E+01	6.91E-12
232Th	6.53E-09	1.72E-09	4.90E-09	4.90E-12	8.0E+00	3.92E-11	0.00%	4.90E-12	8.0E+00	3.92E-11
231Pa	5.91E-11	1.56E-11	4.43E-11	4.43E-14	1.2E+01	5.32E-13	0.00%	4.43E-14	1.2E+01	5.32E-13
232U	4.84E-07	1.28E-07	3.62E-07	3.62E-10	1.1E+01	3.99E-09	0.00%	3.62E-10	1.1E+01	3.99E-09
233U	1.87E-06	4.94E-07	1.40E-06	1.40E-09	3.1E+00	4.35E-09	0.00%	1.40E-09	3.1E+00	4.35E-09
234U	3.19E-05	8.41E-06	2.39E-05	2.39E-08	3.1E+00	7.41E-08	0.01%	2.39E-08	3.1E+00	7.41E-08
235U	1.41E-06	3.72E-07	1.06E-06	1.06E-09	3.0E+00	3.17E-09	0.00%	1.06E-09	3.0E+00	3.17E-09
236U	3.61E-07	9.53E-08	2.71E-07	2.71E-10	2.9E+00	7.85E-10	0.00%	2.71E-10	2.9E+00	7.85E-10
238U	9.35E-07	2.47E-07	7.01E-07	7.01E-10	2.8E+00	1.96E-09	0.00%	7.01E-10	2.8E+00	1.96E-09
237Np	3.23E-05	8.53E-06	2.42E-05	2.42E-08	1.2E+01	2.91E-07	0.04%	2.42E-08	1.2E+01	2.91E-07
238Pu	3.24E-05	8.55E-06	2.43E-05	2.43E-08	7.6E+00	1.85E-07	0.03%	2.43E-08	7.6E+00	1.85E-07
239Pu	1.30E-03	3.43E-04	9.74E-04	9.74E-07	8.2E+00	7.98E-06	1.13%	9.74E-07	8.2E+00	7.98E-06
240Pu	1.90E-04	5.01E-05	1.42E-04	1.42E-07	8.2E+00	1.17E-06	0.16%	1.42E-07	8.2E+00	1.17E-06
241Pu	6.77E-04	1.79E-04	5.08E-04	5.08E-07	1.3E-01	6.60E-08	0.01%	5.08E-07	1.3E-01	6.60E-08
242Pu	1.65E-03	4.35E-04	1.23E-03	1.23E-06	7.8E+00	9.63E-06	1.36%	1.23E-06	7.8E+00	9.63E-06
241Am	5.80E-07	1.53E-07	4.35E-07	4.35E-10	1.3E+01	5.65E-09	0.00%	4.35E-10	1.3E+01	5.65E-09
243Am	7.33E-09	1.93E-09	5.49E-09	5.49E-12	1.3E+01	7.14E-11	0.00%	5.49E-12	1.3E+01	7.14E-11
242Cm	1.57E-08	4.14E-09	1.18E-08	1.18E-11	4.1E-01	4.82E-12	0.00%	1.18E-11	4.1E-01	4.82E-12
243Cm	9.29E-08	2.45E-08	6.96E-08	6.96E-11	8.5E+00	5.92E-10	0.00%	6.96E-11	8.5E+00	5.92E-10
244Cm	1.76E-06	4.63E-07	1.32E-06	1.32E-09	6.7E+00	8.82E-09	0.00%	1.32E-09	6.7E+00	8.82E-09
Total	**1.36E+01**		**1.02E+01**	**1.02E-02**		**7.08E-04**	**100.00%**	**1.02E-02**		**7.08E-04**

Notes:

[a] *HNF-3602, Rev 1, Calculating Potential-to-Emit Releases and Doses for FEMPs and NOCs*

[b] Cutting methods include, saws, shears or other manual methods which will not increase the release fraction in accordance with 40CFR61, Appendix D.

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ATTACHMENT 11

POTENTIAL UNABATED EMISSIONS AND DOSE FOR SOIL EXCAVATION ACTIVITIES

POTENTIAL UNABATED EMISSIONS AND DOSE FOR SOIL EXCAVATION ACTIVITIES

HAND DIGGING SOIL EXCAVATION ACTIVITIES

MAXIMUM SOIL EXCAVATED	1,000	FEET^3		
SOIL DENSITY	98	POUNDS/FEET^3		
TOTAL MASS OF SOIL [a] (TMS)	4.45E+07	GRAMS		
MAXIMUM ALPHA READING (MA)	10	CPM		
MAXIMUM BETA/GAMMA READING (MB)	800	CPM	8,000	dpm/probe*
RELEASE FRACTION (RF)	1.00E-03			

ASSUMED ISOTOPE	CONVERSION FACTOR (pCi/gram)/cpm (a)	POSSESSION QUANTITY (b) Ci	UNABATED RELEASE, Ci	OFFSITE DOSE FACTOR, mrem/Ci	UNABATED DOSE, mrem/yr	% UNABATED OFFSITE DOSE	ABATED RELEASE (d), Ci	OFFSITE DOSE FACTOR, mrem/Ci	ABATED DOSE (d), mrem/yr
	A	B =A*TSM*MB/1E12	C =B*RF	D	E =C*D	F =E/(sum of E)	G =B*RF	H	I =G*H
Sr-90	0.35	1.26E-02	1.26E-05	1.10E-01	1.39E-06	1.66%	1.26E-05	1.10E-01	1.39E-06
Am-241	14.20	6.31E-03	6.31E-06	1.30E+01	8.21E-05	98.34%	6.31E-06	1.30E+01	8.21E-05
TOTAL		1.89E-02	1.89E-05		8.34E-05	100.00%	1.89E-05		8.34E-05

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GUZZLER SOIL EXCAVATION ACTIVITIES

MAXIMUM SOIL EXCAVATED	1,000	FEET^3		
SOIL DENSITY	96	POUNDS/FEET^3		
TOTAL MASS OF SOIL * (TMS)	4.445E+07	GRAMS		
MAXIMUM ALPHA READING (MA)	10	CPM		
MAXIMUM BETA/GAMMA READING (MB)	800	CPM	8,000	dpm/probe*
RELEASE FRACTION (RF)	1.00E+00			

ASSUMED ISOTOPE	CONVERSION FACTOR (pCi/gram)/cpm (a)	POSSESSION QUANTITY (b) Ci	UNABATED RELEASE, Ci	OFFSITE DOSE FACTOR, mrem/Ci	UNABATED DOSE, mrem/yr	% UNABATED OFFSITE DOSE	ABATED RELEASE (d), Ci	OFFSITE DOSE FACTOR, mrem/Ci	ABATED DOSE (d), mrem/yr
	A	B =A*TSM*MB/1E12	C =B*RF	D	E =C*D	F =E/(sum of E)	G =B*RF	H	I =G*H
Sr-90	0.35	1.26E-02	1.26E-02	1.10E-01	1.39E-03	1.66%	1.26E-02	1.10E-01	1.39E-03
Am-241	14.20	6.31E-03	6.31E-03	1.30E+01	8.21E-02	98.34%	6.31E-03	1.30E+01	8.21E-02
TOTAL		1.89E-02	1.89E-02		8.34E-02	100.00%	1.89E-02		8.34E-02

Notes:

[a] HNF-2418, Soil Contamination Standards for Protection of Personnel, March 1998, P.D. Rittmann Tables 1 and 4 based on 500 mrem/yr.

[b] WEIGHT OF SOIL X FIELD INSTRUMENT READING X CONVERSION FACTOR.

[c] HNF-3602, Rev 1, Calculating Potential-to-Emit Releases and Doses for FEMPs and NOCs. The Offsite Dose Factor is an annual quantity.

[d] There is no emissons contol equipment. Abated and unabated values are equal.

* Source RSR # 221996 (5-28-96) average of values not including Grid B. dpm includes a correction factor of 10. dpm = cpm*correction factor

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ATTACHMENT 12

POTENTIAL UNABATED EMISSIONS AND DOSE FOR INSTALLATION/OPERATION OF PASSIVE BREATHER FILTER ASSEMBLY

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Remaining Volume (RV)[1]	5400	gallons
Release Fraction for Remaining Volume (RF)	1.00E-03	40 CFR 61, Appendix D

Analyte	Weighted Average Concentration (curies/gallon)	Possession Quantity (curies)	Unabated Release (curies)[2]	Offsite Dose Factor CAP88PC (mrem/curie)	Unabated Offsite Dose[2]	Percent of Offsite Dose
	A	B =A*RV	C =B*RF	D	E =C*D	F =E/(sum of E)
3H	6.60E-05	3.57E-01	3.57E-04	2.5E-05	8.91E-09	0.00%
14C	6.70E-06	3.62E-02	3.62E-05	1.9E-03	6.87E-08	0.00%
59Ni	3.49E-05	1.88E-01	1.88E-04	3.1E-04	5.83E-08	0.00%
60Co	2.43E-07	1.31E-03	1.31E-06	2.5E-01	3.28E-07	0.00%
63Ni	3.37E-03	1.82E+01	1.82E-02	2.6E-04	4.73E-06	0.00%
79Se	3.48E-06	1.88E-02	1.88E-05	1.3E-01	2.45E-06	0.00%
90Y	5.59E+00	3.02E+04	3.02E+01	3.4E-04	1.03E-02	0.20%
90Sr	5.59E+00	3.02E+04	3.02E+01	1.1E-01	3.32E+00	65.13%
93mNb	1.50E-06	8.10E-03	8.10E-06	2.1E-03	1.70E-08	0.00%
93Zr	1.27E-06	6.85E-03	6.85E-06	1.3E-03	8.90E-09	0.00%
99Tc	3.01E-04	1.63E+00	1.63E-03	2.3E-02	3.74E-05	0.00%
106Ru	2.39E-10	1.29E-06	1.29E-09	1.6E-02	2.07E-11	0.00%
113mCd	3.69E-06	1.99E-02	1.99E-05	1.3E-01	2.59E-06	0.00%
125Sb	3.34E-07	1.80E-03	1.80E-06	2.6E-02	4.69E-08	0.00%
126Sn	4.99E-07	2.69E-03	2.69E-06	4.7E-02	1.27E-07	0.00%
129I	1.29E-08	6.95E-05	6.95E-08	2.0E-01	1.39E-08	0.00%
134Cs	7.82E-08	4.22E-04	4.22E-07	1.0E-01	4.22E-08	0.00%
137Cs + D	1.26E+00	6.78E+03	6.78E+00	2.4E-01	1.63E+00	31.89%
137mBa	1.19E+00	6.41E+03	6.41E+00	5.3E-13	3.40E-12	0.00%
151Sm	1.21E-03	6.55E+00	6.55E-03	7.5E-04	4.91E-06	0.00%
152Eu	9.84E-06	5.31E-02	5.31E-05	2.4E-01	1.27E-05	0.00%
154Eu	1.31E-03	7.09E+00	7.09E-03	2.0E-01	1.42E-03	0.03%
155Eu	2.26E-03	1.22E+01	1.22E-02	8.0E-03	9.78E-05	0.00%
226Ra	9.82E-10	5.30E-06	5.30E-09	4.6E-01	2.44E-09	0.00%
228Ra	8.67E-09	4.68E-05	4.68E-08	1.9E-01	8.89E-09	0.00%
227Ac	1.27E-09	6.85E-06	6.85E-09	1.5E+01	1.03E-07	0.00%
229Th	5.76E-10	3.11E-06	3.11E-09	1.6E+01	4.98E-08	0.00%
232Th	6.53E-09	3.53E-05	3.53E-08	8.0E+00	2.82E-07	0.00%
231Pa	5.91E-11	3.19E-07	3.19E-10	1.2E+01	3.83E-09	0.00%
232U	4.84E-07	2.61E-03	2.61E-06	1.1E+01	2.87E-05	0.00%
233U	1.87E-06	1.01E-02	1.01E-05	3.1E+00	3.14E-05	0.00%

234U	3.19E-05	1.72E-01	1.72E-04	3.1E+00	5.34E-04	0.01%
235U	1.41E-06	7.61E-03	7.61E-06	3.0E+00	2.28E-05	0.00%
236U	3.81E-07	1.95E-03	1.95E-06	2.9E+00	5.66E-06	0.00%
238U	9.35E-07	5.05E-03	5.05E-06	2.8E+00	1.41E-05	0.00%
237Np	3.23E-05	1.75E-01	1.75E-04	1.2E+01	2.09E-03	0.04%
238Pu	3.24E-05	1.75E-01	1.75E-04	7.6E+00	1.33E-03	0.03%
239Pu	1.30E-03	7.01E+00	7.01E-03	8.2E+00	5.75E-02	1.13%
240Pu	1.90E-04	1.02E+00	1.02E-03	8.2E+00	8.40E-03	0.16%
241Pu	6.77E-04	3.66E+00	3.66E-03	1.3E-01	4.76E-04	0.01%
242Pu	1.65E-03	8.89E+00	8.89E-03	7.8E+00	6.94E-02	1.36%
241Am	5.80E-07	3.13E-03	3.13E-06	1.3E+01	4.07E-05	0.00%
243Am	7.33E-09	3.96E-05	3.96E-08	1.3E+01	5.14E-07	0.00%
242Cm	1.57E-08	8.48E-05	8.48E-08	4.1E-01	3.47E-08	0.00%
243Cm	9.29E-08	5.01E-04	5.01E-07	8.5E+00	4.26E-06	0.00%
244Cm	1.76E-06	9.49E-03	9.49E-06	6.7E+00	6.36E-05	0.00%
Total	**1.36E+01**	**7.37E+04**	**7.37E+01**		**5.10E+00**	**100.00%**

Note

1. Volume of waste left in 244-CR at the completion of interim stabilization project (source 244-CR Vault Interim Stabilization Project Plan, RPP-6029, Rev 0)

2. Passive breathing: no emission control used. Unabated and abated are equal

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